

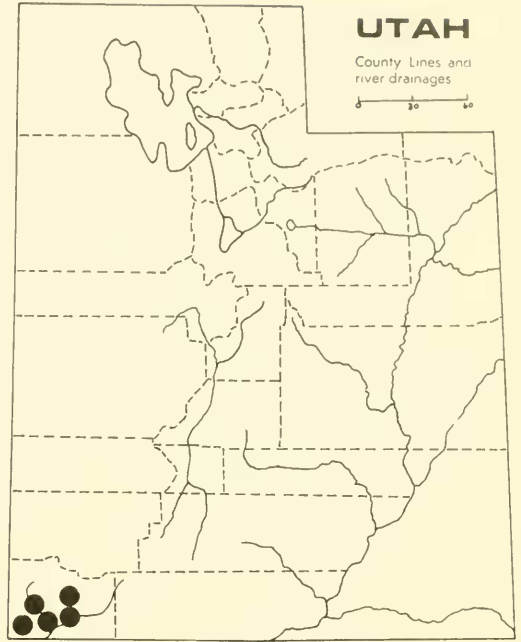


Fig. 1. *Eriodictyon angustifolium* Nutt.

linear, 4-8 cm long, 2-5 cm broad, revolute, thick, entire to toothed; inflorescence of terminal, branched, scorpioid cymes; calyx-lobes subequal, linear, 3 mm long; corolla white, deciduous, narrowly campanulate, 5-6 mm long; stamens included; style divided to base; seeds 6 or less. Type species: *Eriodictyon crassifolium* Benth.

Southern Nevada and southern Utah, east to Arizona, April to August. Commonly on dry chaparral slopes from 2,000 to 7,000 feet. Type locality: "Sierra of Upper California."

Washington County: 3.5 miles N Shivwits junction on road to Gunlock, L. Anderson 742 (UTC); 2 miles N Pintura, A. Rhoads s.n. (UTC); Beaver Dam Mountains 3-5 miles northeast of Arizona State Line, R. Ferris 11587 (UTC); 2.5 miles W Toquerville, B.



Map. 2. Utah distribution of *Eriodictyon angustifolium* Nutt.

Maguire 12317 (UTC); 7 miles up Pine Valley road off U.S. 89 & 91, A. Collotzi et al. 878 (UTC); 14 miles SW St. George, T. Jensen 801 (UTC); Welcome Springs, Beaver Dam Mountains, D. Nish 8 (UTC); St. George, Field Bio. Class S. 18 (UT); Pintura, W. Cottam s.n. (UT); Motoqua W. Cottam 5070 (UT); Bellevue, W. Cottam 3984 (UT); Summit of the Beaver Dam Mountains, D. Atwood 1429 (BRY); Terry's Ranch, Beaver Dam Mountains, L. Higgins 505 (BRY); 2.5 miles N Anderson, S. Welsh 2779 (BRY).

3. *Eucrypta* Nutt.

Fig. 2

Eucrypta Nutt. Journ. Acad. Phila. II. 1: 159. 1847.

Plants annual, fragile, glandular; leaves pinnatifid, the lower petioled, upper auriculate-clasping; corolla white to blue or yellowish, campanulate; calyx divided at least half its length, shorter than the corolla; stamens included; style divided only at the apex; capsules unilocular, ovoid, enclosed by the enlarged calyx; seeds dimorphic, brown to black. Type species: *Eucrypta paniculata* Nutt.

1. *Eucrypta micrantha* (Torr.) Heller

Map 3

Eucrypta micrantha (Torr.) Heller, Muhlenbergia 2: 163. 1906.

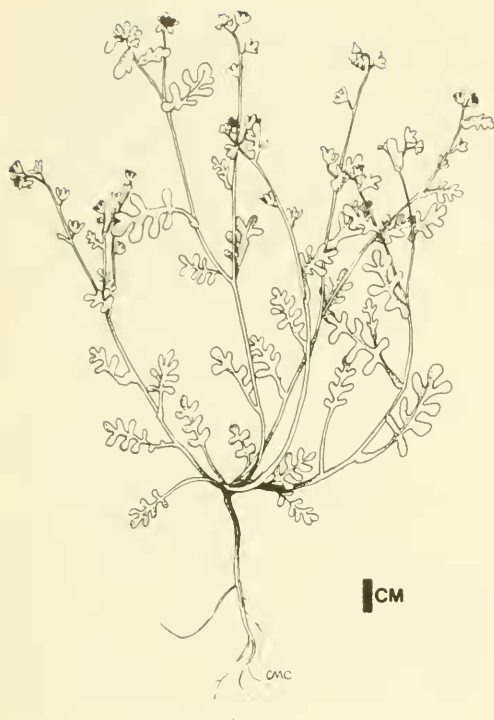


Fig. 2. *Eucrypta micrantha* (Torr.) Heller.

Phacelia micrantha Torr., Bot. Mex. Bound. Surv. 144. 1859.

Phacelia pinetorum Jones, Zoe 4: 279. 1893.

Ellisia micrantha Brand, Pflanzenr. IV. 251: 42. 1913.

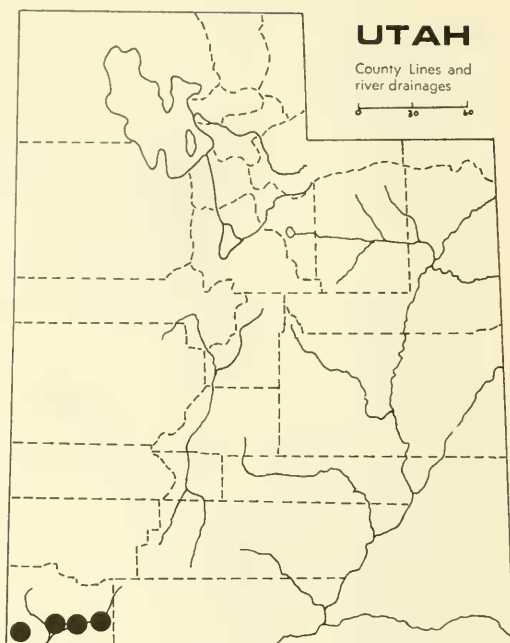
Eucrypta micrantha Heller, Muhlenbergia 2: 163. 1906.

Nyctelea pinetorum (Jones) Tidestrom, Contr. U.S. Nat. Herb. 25: 442. 1925.

Plants annual, 0.5-2.5 dm tall; stems weak, diffuse; leaves pinnatifid, the lower leaves petiolate, the upper auriculate clasping; inflorescence of terminal or axillary cymes; pedicels filiform; calyxlobes oblong to spatulate, 1.5-2 mm long, stipitate-glandular; corolla campanulate, purplish, blue or white, the tube yellow, 2-4 mm long and broad; stamens included; style included, bifid at apex; mature capsule unilocular; seeds 5-15, dimorphic, brown to black.

Western Texas, west to southern Utah and southern California, February to May. Usually as understory or in the shade of rocks below 4,000 feet elevation. Type locality: El Paso County, Texas, stony hills, near El Paso.

Washington County: St. George, M. Jones 1609 (UT, UTC); St. George, F. Gould 1469 (BRY).



Map. 3. Utah distribution of *Eucrypta micrantha* (Torr.) Heller.

UT, UTC); 2 miles W Springdale, A. Cronquist s.n. (UTC); south of St. George, B. Harrison 5668 (BRY); 3 miles S Toquerville, B. Stahmann & J. Jacobs 20 (BRY); Beaver Dam Mountains near Utah-Arizona border on Hwy 91, L. Higgins 363 (BRY).

4. *Hesperochiron* S. Wats.

Hesperochiron S. Wats., Bot. King Expl. 281. pl. 30. 1871.

Plants acaulescent perennials from a thick root; leaves simple, petioled, in a basal rosette; flowers long petioled, solitary in the leaf axils; corolla white to blue funnelform to rotate; sepals unequal, ciliate; stamens included, inserted on the tube of the corolla; filaments basally dilated; style bifid at the apex; capsule unilocular; seeds numerous, dark brown, pitted.

1. *Hesperochiron pumilus* (Griseb.) Porter Fig. 3; Map 4

Hesperochiron pumilus (Griseb.) Porter, Hayden Geol. Rep. 768. 1872.

Villarsia pumila Griseb. in Hook. Fl. Bor. Amer. 2: 70. pl. 157. 1838.

Hesperochiron pumilus Porter, 1. c.

Capnorea pumila (Dougl.) Greene, Erythea 2: 193. 1894.

Capnorea watsoniana Greene, Pittonia 5: 44. 1902.

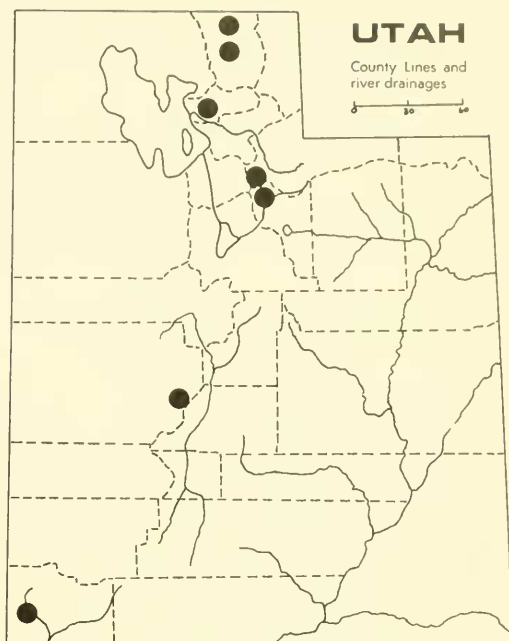


Fig. 3. *Hesperochiron pumilus* (Griseb.) Porter.

Plants dwarf, acaulescent perennials, 2-12 cm tall, short-villous; leaves in a basal rosette, petiolate, simple, linear to oblanceolate, 1.5-5 cm long; peduncles borne single in the axils of the leaves, erect; sepals linear to oblong, usually unequal, 3-8 mm long; corolla rotate white to light blue, 0.5-1.6 cm long, densely hairy within; stamens included, inserted unequally on the corolla-tube, filaments dilated below; style included, 2-cleft at apex; mature capsule unilocular; seeds numerous, dark brown, alveolate. Type species: *Ourisia californica* Benth.

Idaho and Washington, south to northern Arizona and California, April to July. Springs, wet meadows, and moist stream banks from 5,100 to 8,000 feet. Type locality: "Vallies of the Rocky Mountains, between Kettle Falls and Spokane."

Cache County: White Pine Lake, B. Maguire et al. 14019 (UTC); Tony Grove Lake, S. Tillet & D. Crockett 237 (UTC); Beaver Fork Logan Canyon, B. Maguire 16699 (UTC). Millard County: Snake Valley, Mound Spring, B. Harrison 6349 (BRY). Summit County: Kimball Creek near Sniderville, J. Stevenson s.n. (UT); Mt. Timpanogos, 1 mile W Alpine Loop, W. Cottam 12742 (UT). Washington County: Upper Kolob, D. Beck, 40 (BRY). Wasatch County: 3 miles N North Canyon, Idaho, W. Cottam s.n. (UT). Weber County: north of Eden, W. Cottam s.n. (UT); Ogden Canyon, W. Cottam 7219 (UT); west of Eden, Milner 9444 (UT);



Map 4. Utah distribution of *Hesperochiron pumilus* (Griseb.) Porter.

along Bennett Creek near Huntsville, D. Atwood 28 (UTC).

5. *Hydrophyllum* L. Water-leaf

Hydrophyllum L. Sp. Pl. 146. 1753.

Plants perennial, 1-6 dm tall; stems erect, succulent, from horizontal rhizomes, these bearing fleshy fibrous or tuberous roots; leaves pinnately compound, mostly basal, oblong, ovate or oval in outline, 3-20 cm long; petioles slightly dilated and clasping at the base, ciliate; inflorescence composed of 1-several globose or lax cymes, short pubescent or strigose and hispid; calyx divided nearly to the base, linear, oblong or lanceolate, 3-6 cm long, 0.5-2 mm wide; corolla campanulate purplish to blue, white or violet, 5-10 mm long; stamens 5, exserted 4-6 mm; style 1, exserted 5-10 mm, cleft 1-2 mm; stigmas capitate; ovules attached to the front of the two large parietal placentae; seeds 1-3, brown, subglobose, reticulate. Type species: *Hydrophyllum virginianum* L.

- | | |
|---|---|
| 1a. Flowers in dense capitate clusters, peduncles shorter than the petioles of the subtending leaves; anthers short-oblong. 0.6-1 mm long | 3 |
| 1b. Flowers in open clusters, peduncles longer than the petioles of the subtending leaves; anthers linear to oblong, 1-2 mm long | 2 |

- 2a. Leaflets acuminate, with 8-12 acuminate teeth; cymes lax in fruit 2. *H. fendleri*
- 2b. Leaflets obtuse to abruptly acute, with 3-6 obtuse to acute teeth, cymes compact in fruit 3. *H. occidentalis*
- 3a. Cymes lax (at least in fruit); pedicles 7-19 mm long, reflexed in fruit; plants low (2.5 dm tall or less) and more or less acaulescent 1a. *H. capitatum* var. *alpinum*
- 3b. Cymes capitate even in fruit; pedicles 2-5 mm long, not reflexed; plants usually taller (1-5 dm high) and caulescent 1b. *H. capitatum* var. *capitatum*

1. *Hydrophyllum capitatum* Dougl.
ex Benth.

Hydrophyllum capitatum Dougl. ex Benth.,
Trans. Linn. Soc. 17: 272. 1836.

Plants 1-5 dm high, from short rhizomes, these bearing a fascicle of fleshy fingerlike roots; stems short; leaves pinnately compound, ovate to oval in outline, strigose, the blade 2.5-10 cm long, 2-13 cm wide, the primary divisions 5-7 obovate to oblong or lanceolate, lobes and divisions acute, obtuse or mucronate; inflorescence of 1-several globose cymes, the peduncles 1-5 cm long, shorter than the subtending leaves, mostly recurved in fruit; pedicels 2-5 mm long; sepals obtuse or abruptly acute, 3-4 mm long, 1.5 mm or less broad, ciliate and strigose; corolla 5-9 mm long, purplish, blue or white; stamens exserted 5 mm; style exserted 5-10 mm; seeds normally 2, light brown, 2-3 mm in diameter.

Alberta to British Columbia, south to Oregon, Utah, and Colorado. Mostly present as understory from 5,000 to 9,500 feet elevation. April to June. Type locality: "In the interior of Columbia in Northwest America."

1a. *Hydrophyllum capitatum* Dougl.
ex Benth. var. *alpinum* S. Wats.

Fig. 4; Map 5

Hydrophyllum capitatum Dougl. ex Benth. var. *alpinum* S. Wats., Bot. King Exped. 249. 1871.

Hydrophyllum alpestre Nels. & Kennedy, Muhlenbergia 3: 142. 1908.

Hydrophyllum alpinum Greene ex Brand, Pflanzenr. IV. 251: 33. 1913, nomen in synon.

Plants low, 2.5 dm tall or less and essentially acaulescent; inflorescence from near the surface of the ground, lax at least in fruit, pedicels 7-19 cm long, reflexed in fruit.

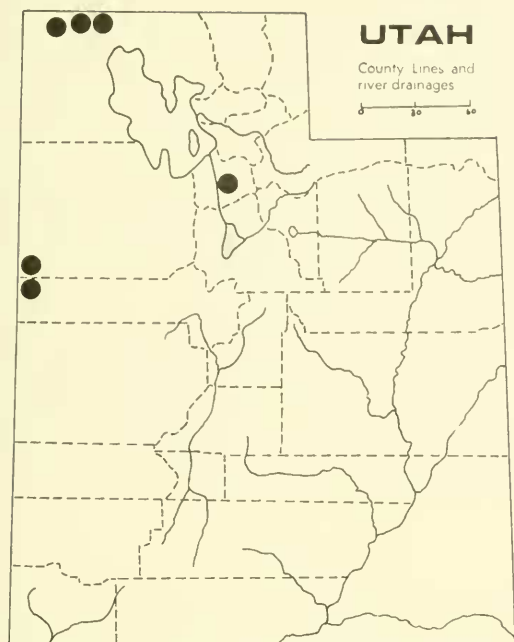
Central Oregon and southwestern Idaho to western Utah, northern Nevada and northeastern California, 2,500 to 10,000 feet elevation. Meadow, stream sides, and moist mountain slopes, May to July.

Box Elder County: George Creek Canyon, Raft

River Mountains, Preece, Jr. 584 (UT); Clear Creek Canyon, Raft River Mountains, S. Preece, Jr. 930 (UT). Juab County: headwaters of Indian Farm Creek. Deep Creek Range, A. Holmgren & B. Maguire 21994 (UTC); Queen Sheba Mine, Deep Creek Mountains, W. Cottam 7137 (UT). Salt Lake County: City Creek Canyon, R. Solander s.n. (UT). Tooele County: Deep Creek Mountains, W. Cottam 7137 (UT).



Fig. 4. *Hydrophyllum capitatum* Dougl. ex Benth. var. *alpinum* S. Wats.



Map 5. Utah distribution of *Hydrophyllum capitatum* Dougl. ex Benth. var. *alpinum* S. Wats.

1b. *Hydrophyllum capitatum* Dougl.
ex Benth. var. *capitatum*

Fig. 5; Map 6

Hydrophyllum capitatum Dougl. ex Benth. var. *capitatum*, 1. c.

Hydrophyllum densiflorum Nutt. ex Hook., Kew Journ. Bot. 3: 292. 1851, nomen in synon.

Hydrophyllum pumilum Geyer ex Hook., Kew Journ. Bot. 3: 292. 1851, nomen in synon.

Hydrophyllum capitatum Dougl. ex Benth. var. *pumilum* Hook., Kew Journ. Bot. 3: 292. 1851.

Hydrophyllum capitatum Dougl. ex Benth. var. *pumilum* Hook. subvar. *densum* Brand. Pflanz. IV. 251: 33. Fig. 5. 1913.

Hydrophyllum capitatum Dougl. ex Benth. var. *alpinum* S. Wats. subvar. *laxum* Brand. Pflanz. IV. 251: 33. 1913.

Plants 1-4.3 dm tall; stems usually acaulescent; cymes capitate even in fruit, the pedicels 2-5 mm long; peduncles 1-5 cm long, shorter than the subtending leaves.

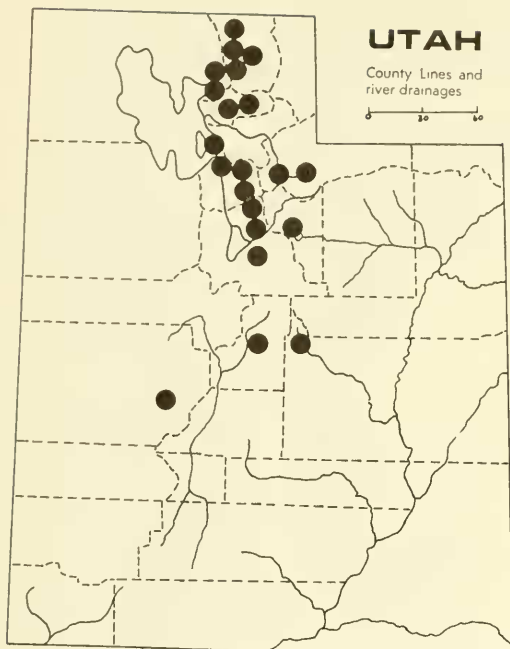
Southern Alberta and British Columbia, south to Oregon, Utah and Colorado.

Box Elder County: Box Elder Canyon, 3 miles from Brigham City, R. Stevens, 175, (BRY); 3 miles W Mantua, R. Stevens 166 (BRY); Gold Water Canyon, Wellsville Mountains, M. Burke 3089 (UTC). Cache County: 3 miles up Logan Canyon, B. & R. Maguire 3682 (UTC); 11 miles up Smithfield Canyon, B. Maguire 13758 (UTC); 3 miles above the mouth of Green Canyon, Logan,



Fig. 5. *Hydrophyllum capitatum* Dougl. ex Benth. var. *capitatum*.

A. Cronquist 1937 (UTC); Tony Grove Lake, S. Tillett & D. Crockett 225 (UTC). Davis County: Mueller Park, Brizzee s.n. (UT); Farmington Canyon, S. Clark 515 (UTC); foothills between Barton & Mill Creek, Bountiful, B. & R. Anderson 62 (UTC). Emery County: Huntington Canyon, W. Cottam 7468 (UT). Salt Lake County: City Creek Canyon, C. Woodbury s.n. (UT); Cottonwood Canyon, R. Eastmond 185 (BRY); Emigration Canyon, Baker 1111 (UT); Big Butte Canyon, Swanson 16 (UT). Sanpete County: Great Basin Exp. Station, A. Holmgren & R. Shaw 7644 (UTC); New Canyon Lake, R. Stevens 22 (BRY). Summit County: above Holliday Park, Vickery, Jr. 640 (UT); Peoa, S. Welsh 519 (BRY); Upper Provo



Map 6. Utah distribution of *Hydrophyllum capitatum* Dougl. ex Benth. var. *capitatum*.

River, 3 miles S Trial Lake, B. Harrison 11013 (BRY); east of Kamas, W. Stubbs 72 (BRY). Utah County: Deer Creek Canyon, B. Harrison 8310 (BRY); north of Lehi, H. Chapman 7 (BRY); east of Springville, B. Harrison 51H (BRY); Hobbie Creek Canyon, P. Replogle 79 (BRY); Aspen Grove, K. Shaw 105 (BRY); 3 miles N Wildwood on highway 80, W. Buss 117 (BRY). Wasatch County: Strawberry Valley, V. Matthews 40 (BRY); Mud Creek, Laycock & Conrad, MC74 (BRY). Weber County: Ben Lomond Trail, W. Call 26 (UT); south of Weber State College Union Building, A. Collotzi 154 (UTC); near Liberty Divide, R. Bragonji 7 (BRY).

2. *Hydrophyllum fendleri* (Gray) Heller

Fig. 6; Map 7

Hydrophyllum fendleri (Gray) Heller, Pl. World 1: 23. 1897.

Hydrophyllum occidentale (S. Wats.) Gray var. *fendleri* Gray, Proc. Amer. Acad. 10: 314. 1875.

Hydrophyllum fendleri Heller, l. c.

Hydrophyllum albiformis Heller var. *fendleri* Brand, Pflanzenr. IV. 251: 34. 1913.

Plants perennial, 2-9 dm tall from short rhizomes, these bearing fleshy-fibrous roots; stems erect, retrorse-hispid; leaves pinnately compound, ovate or oval in outline, strigose, the blade 6-30 cm long, with 9-13 primary divisions, these ovate to lanceolate, acuminate, coarsely

serrate or incised; inflorescence of 1-several lax cymes, peduncles 3-17 cm long, often branched, mostly longer than the subtending leaves (at least in fruit); pedicels 2-7 mm long; sepals linear to lanceolate (in fruit), 4-6 mm long, 1-2 mm broad, ciliate and strigose, often hispid dorsally, corolla 6-10 mm long, white to violet; stamens exserted 4-6 mm; style exserted 5-7 mm; seeds 1-3, light brown, 2.5-3 mm in diameter.

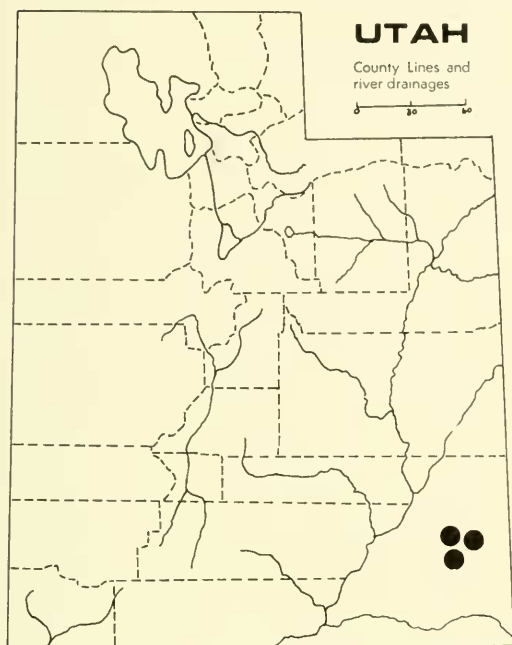
Wyoming to Washington, south to New Mexico and Utah, 5,500 to 10,500 feet. Restricted and rare; possibly threatened. Along streams and other moist areas in the mountains, often in thickets and spruce-fir-populus communities. June to August. Type locality: Santa Fe Creek, New Mexico.



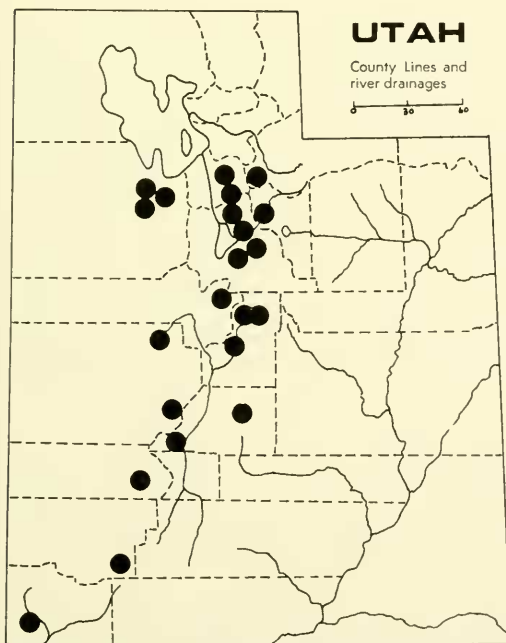
Fig. 6. *Hydrophyllum fendleri* (Gray) Heller.

San Juan County: North Creek, Abajo Mountains, 8 miles W Monticello, A. Cronquist & N. Holmgren 9407 (UTC); Dream Mine, B.

Maguire et al. 2043 (UTC); west side of South Mountain, B. Maguire & Reed 2042 (UTC); Blue Mountains, W. Cottam 12194 (UTC); Indian Creek Ranger Station, W. Cottam 9664 (UT).



Map 7. Utah distribution of *Hydrophyllum fendleri* (Gray) Heller.



Map 8. Utah distribution of *Hydrophyllum occidentale* (S. Wats.) Gray.

3. *Hydrophyllum occidentale* (S. Wats.) Gray

Fig. 7: Map 8

Hydrophyllum occidentale (S. Wats.) Gray, Proc. Amer. Acad. 10: 314. 1875.

Hydrophyllum macrophyllum var. *occidentale* S. Wats., Bot. King Expl. 248. 1871.

Hydrophyllum occidentale A. Gray, Proc. Amer. Acad. 10: 314. 1875.

Hydrophyllum watsonii Rydberg, Bull. Torr. Bot. Club 40: 478. 1913.

Plants perennial, 1-6 dm tall, rhizome bearing fleshy-fibrous roots; stems erect, short pubescent to more or less retrorse-



Fig. 7. *Hydrophyllum occidentale* (S. Wats.) Gray.

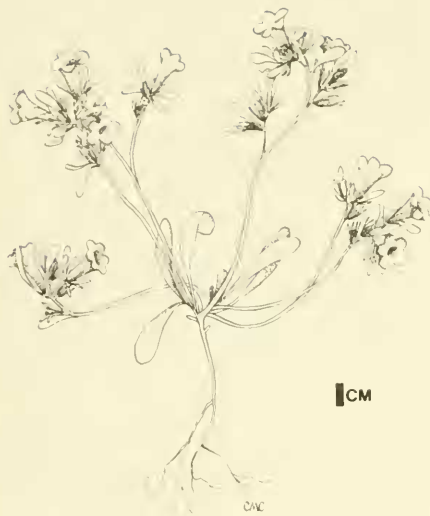


Fig. 8. *Nama demissum* Gray.

hispid; leaves pinnately compound, oblong in outline, strigose, the blade 5-28 cm long, with 7-15 primary divisions, these broadly oblong to ovate, obtuse, incised or lobed; inflorescence with one to several globose cymes, peduncles 5-27 cm long, usually exceeding the subtending leaves; pedicels 2-5 mm long; sepals narrowly lanceolate, 3.5-5 mm long, 1-2 mm wide, strigulose dorsally to hispid ciliate on the margins; corolla 7-10 mm long, white to violet; stamens exserted 4-6 mm; style exserted 5-8 mm; seeds 1-2, brown, 2.5-3.1 mm in diameter.

Western Oregon, south to central California, east to Utah and Arizona, 5,000 to 10,000 feet elevation. Moist shaded areas in the mountains, often in mountain brush thickets and spruce-fir-populus communities, late April to mid-July. Type locality: California.

Beaver County: 10 miles N Beaver, B. Harrison 279 (BRY). Iron County: Cedar Canyon, South Fork, W. Cottam 3980 (BRY). Juab

County: Mt. Nebo. R. Gierisch s.n. (BRY, UTC). Millard County: Oak City Canyon, W. Cottam 9611 (UT); ca 20 miles W Salina, F. Coles 43 (BRY). Salt Lake County: Emigration Canyon. C. Smith 1849 (UTC); T. 1N., R. 1E., sec. 34, L. Arnow 1197 (BRY, UT); near Mill Creek, A. Standing 145 (UT); east of Fort Douglas, R. Vickery, Jr. 566 (UT); City Creek Canyon, A. Garrett 1782 (UT); Dry Fork Canyon, P. Farnsworth s.n. (UT). Sanpete County: Maple Canyon, E. Johnson 5788 (BRY); 10 miles W Moroni, B. Maguire 18655 (BRY, UTC); 14 miles NW Fayette, T. Jensen 261 (UTC); ca 4 miles W Freedom, R. Tiffany s.n. (BRY). Sevier County: Willow Creek, D. Jeffery s.n. (UTC); Summit Fish Lake National Forest, east of Cove Fort, D. Atwood 1514 (BRY). Tooele County, ca 12 miles SE Tooele, L. Higgins 3344 (BRY); 5 miles S Vernon, R. Parker 143 (BRY); Stansbury Range, South Willow Creek, B. Maguire 21811 (BRY); south of Benmore headquarters, Intermountain Forest and Range Experiment Station N. Frischknecht 24 (UTC). Utah County; Hobbie Creek, Condon s.n. (UT); 3 miles NW Alpine, G. Davidse et al. 336 (UTC); 10 miles E Springville, L. Pack 9 (BRY); Jordan Narrows, no author s.n. (BRY); Payson Canyon, D. Braithwaite 18 (BRY). Wasatch County: Cascade Springs, S. Sanderson x28 (BRY). Washington County: Beaver Dam Mountains, D. Atwood 1447 (BRY); near relay tower, Beaver Dam Mountains, L. Higgins 660 (BRY).

6. *Nama* L.

Nama L. Syst. Nat. ed. 10. 2: 950. 1759.

Plants low, branching annuals, 0.5-3 dm tall; leaves alternate entire, hirsutulous to hispid, retrorse to erect; inflorescence of terminal, nonscorpoid cymes; sepals subequal, linear to lanceolate; corolla purple or lavender, deciduous, tubular to funnellform; stamens included, borne unequally on the corolla tube; style included, divided to the base or 2-lobed at the apex; mature capsule falsely bilocular by intrusion of the placentae; ovules numerous; seeds numerous, brown, mostly reticulate. Type species: *Nama jamaicense* L.

- 1a. Style shallowly 2-lobed at the apex; corolla tubular, 3-5 mm long; Uintah, Grand, Wayne, and Garfield counties 2. *N. densum* Lemmon var. *parviflorum* (Greenm.) Hitchc.
- 1b. Style divided to the base; corolla mostly 8-15 mm long or if less then the shorter stem hairs retrorse (corolla 4-7 mm long in *N. retrorsum*) 2
- 2a. Leaves mostly in clusters at the ends of the branches and in a basal rosette; herbage hirsutulous or pilose; Washington, Millard and Tooele counties 1. *N. demissum* Gray
- 2b. Leaves well distributed along the stem; herbage hirsute or hispid 3

- 3a. Stems erect, fastigate; shorter stem hairs retrorse; corolla 4-7 mm long;
Kane, Garfield, and Grand counties 4. *N. retrorsum* J. T. Howell
- 3b. Stems more or less spreading; stem hairs ascending; corolla 7-15 mm
long 3. *N. hispidum* Gray

1. *Nama demissum* Gray
Fig. 8; Map 9

Nama demissum Gray, Proc. Amer. Acad. 8: 283. 1870.
Conanthus demissus (Gray) Heller, Cat. N. Amer. pl. 6. 1898.
Nama demissum Gray var. *deserti* Brand, Pflanzentr. IV, 251: 159. 1913.

Diffusely branched annuals, 0.2-1.4 dm tall, hirsute; leaves entire, 1-3.2 cm long, 1-5 mm wide; flowers solitary to several, subsessile; sepals linear to lanceolate, 5-8 mm long; corolla broadly funnelform, 8-16 mm long, 6-11 mm wide; style divided to base, 3-5 mm long; seeds mostly 10-15, 0.5 mm long, dark brown, pitted and reticulate. Type locality: Nevada.

California, north to Nevada and southwestern Utah. Sandy to gravelly hillsides and draws in the Lower and Upper Sonoran Zone, 2,500 to 5,300 feet elevation. March to June.

Millard County: Tabernacle Crater, C. McMillan 1433 (UT); cinder cones, W. Cottam 8005a (UT). Washington County: St. George, M.

Jones s.n. (UT); Beaver Dam Wash, K. Kelson s.n. (UT); west of St. George Airport, W. Cottam 8436 (UT); Diamond Valley, W. Cottam 4072 (BRY); ca 1 mile below Terry's Ranch, L. Shumway 28 (BRY); Shem, W. Cottam 5057 (UT); west slope of Beaver Dam Mountain, D. Nish s.n. (UTC); Dixie State Park, L. Higgins 940 (BRY).

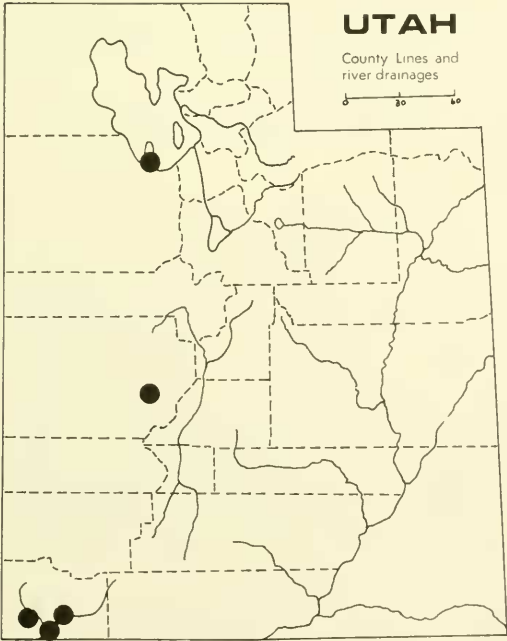
2. *Nama densum* Lemmon
Fig. 9; Map 10

Nama densum Lemmon, Bull. Torr. Bot. Club 16: 222. 1889.
Nama demissa S. Wats., Bot. King Expl. 259. 1871, in part.
Conanthus parviflorus Greenman, Erythea 7: 117. 1899.

Dichotomously branched annuals, the branches prostrate, hirsute; leaves 0.4-1.9 cm long, 1-5 mm wide, entire; flowers sessile and solitary in the upper leaf axils; calyx-lobes linear, 4-5 mm long, 1-3 mm wide; style 0.5-1.5 mm long, 2-lobed at the apex; seeds ca 15, dark brown, 0.5-0.8 mm long, pitted and reticulate. Type locality: California: near Edgewood.

Great Basin, from southern Idaho and central Washington, south to California and Utah. Commonly in loose gravelly to sandy soils of *Artemisia*, *Juniperus*, and *Vanclevea* communities. May to June.

Grand County: 16 miles NW Moab, Courthouse Wash, A. Cronquist 9075 (UTC). Uintah



Map 9. Utah distribution of *Nama demissum* Gray.

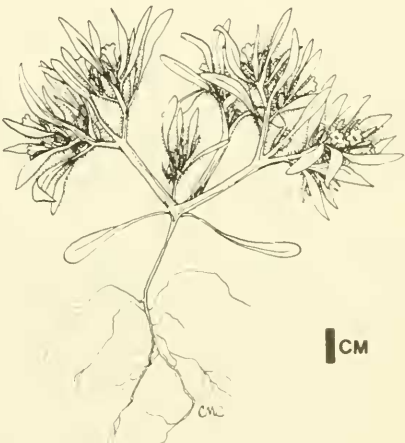
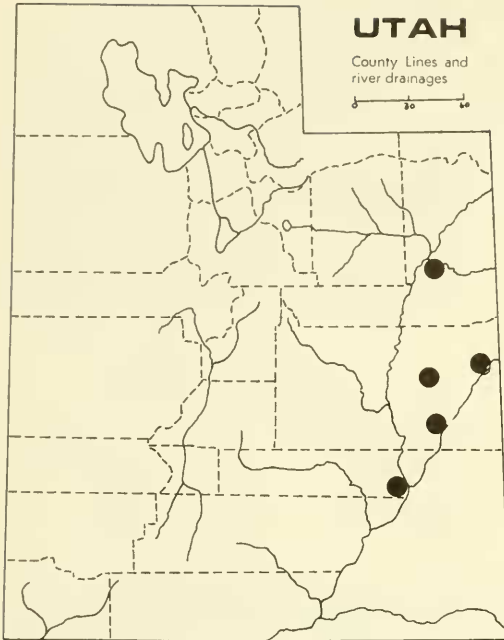


Fig. 9. *Nama densum* Lemmon.



Map 10. Utah distribution of *Nama densum* Lemmon.

County: 13.5 miles S Ouray, N. Holmgren & J. Reveal 1914 (BRY, UTC). Wayne County: 7 miles from Hite along the Crescent Creek drainage, A. H. Holmgren et al. 7783 (UTC).

3. *Nama hispidum* A. Gray

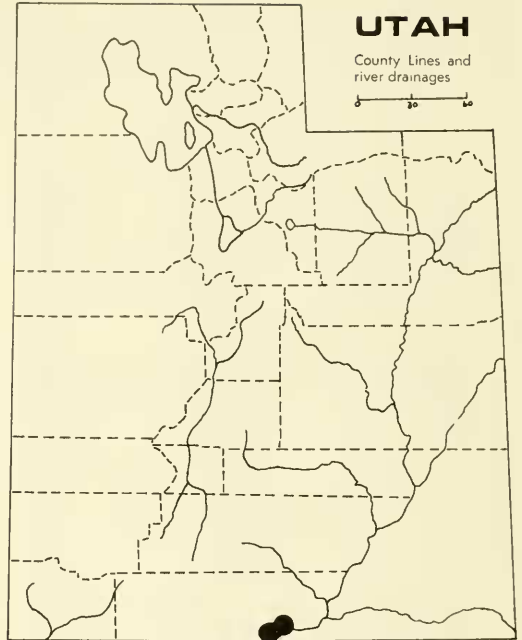
Map 11

Nama hispidum A. Gray, Proc. Amer. Acad. 5: 339. 1861.

Marilaunidium tenue Small, Bull. Torr. Bot. Club 25: 142. 1898.

Leafy, branched annuals, 1-3 dm tall; stems more or less spreading, hispid; leaves 1-7 cm long, 2-5 mm wide, entire, revolute; flowers solitary to several in terminal cymes; sepals linear to lanceolate, 5-8 mm long; corolla purple, broadly funnelform, 8-14 mm long, 7-8 mm wide; style 2-5 mm long, cleft to the base; seeds numerous, 0.5 mm long, yellowish brown, reticulate. Type locality: Texas.

Lower and Upper Sonoran Zones, from southeastern California, east to southern



Map 11. Utah distribution of *Nama hispidum* A. Gray.

Colorado, south to Texas and northern Mexico. Sandy and gravelly hills and flats from 1,600 to 4,000 feet elevation. April to July.

Kane County: north of Wahweap Marina, S. Welsh & D. Atwood 9770 (BRY); southwest base of Romana Mesa, Lake Powell, D. Atwood 3287 (BRY).

4. *Nama retrorsum* J. T. Howell

Map 12

Nama retrorsum J. T. Howell, Leaf. West. Bot. 5: 149. 1949.

Leafy, branched annuals, 1-3 dm tall; stems erect, fastigiate, hirsute, the shorter stem hairs retrorse; leaves 1.5-5 cm long, 2-5 mm wide, entire; flowers sessile and solitary in the upper leaf axils; sepals linear, 5 mm long, hirsute; corolla purple, funnelform, 4-7 mm long; seeds 0.6-0.8 mm long. Type locality: Coconino County, Arizona: Kletthla Valley.

Northeastern Arizona and southeastern Utah deep sands from 5,000 to 7,000 feet.

Restricted and local; possibly threatened. May to July.

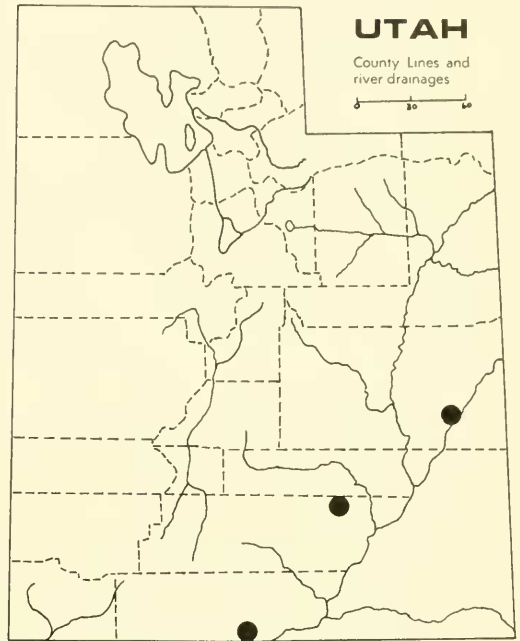
Garfield County: ca 25 miles S Hanksville and 1 mile N Bullfrog junction, S. Welsh, D. Atwood & L. Higgins 8963 (BRY, UT). Grand County: Landscape Arch, Arches National Monument, S. Welsh & G. Moore 2026 (BRY). Kane County: ca 5 miles S Glen Canyon City on Cedar Mountain, D. Atwood 3109 (BRY).

7. *Nemophila* Nutt. ex Barton

Nemophila Nutt. ex Barton, Fl. N. Amer. 2: 71. 1822; Journ. Acad. Phila. 2: 179. 1822. Nomen. conservandum.

Delicate annuals, 0.5-3 dm tall; stems sharply angled (obscurely so in *N. parviflora*), glabrous, except for small, reflexed prickles; leaves alternate or opposite, 0.7-2.9 cm long, 1.5-4 cm wide, pinnately divided, sparsely hispid; flowers solitary in the upper leaf axils, pedicellate; calyx divided nearly to the base, the lobes linear to lanceolate, 3 mm long, 1-2 mm wide, with reflexed auricles; corolla narrowly campanulate, purplish or white, 1.5-2.9 mm wide; stamens included, equally inserted on the corolla; style 0.5-1 mm long; seeds usually 1-4, globose, 2-3 mm long,

brick-red, pitted. Type species: *Nemophila phacelioides* Nutt.



Map 12. Utah distribution of *Nama retrorsum* J. T. Howell.

1a. Leaves all alternate; seeds usually 1; calyx 3 mm long; style cleft only at the apex; capsule shorter than the strongly accrescent calyx; Box Elder and Cache counties, south to Sanpete and Juab counties

1. *N. breviflora* Gray

1b. Leaves all opposite; seeds mostly 2-4; calyx 1-3 mm long; style cleft ca 1/2 its length; capsule exceeding the calyx; presently known only from Weber County 2. *N. parviflora* Dougl. ex Benth. var. *austinae* (Eastw.) Brand

1. *Nemophila breviflora* A. Gray

Fig. 10; Map 13

Nemophila breviflora A. Gray, Proc. Amer. Acad. 10: 315. 1875.

Viticella breviflora Macbride, Contr. Gray Herb. 59: 32. 1919.

Nemophila petrophila L. Williams, Ann. Mo. Bot. Gard. 23: 453. 1936.

Stems weak, 0.5-2 dm long, sharply angled; leaves alternate, pinnately divided, 0.7-3 cm long, 1.5-3.9 cm broad, sparsely hispid; sepals broadly campanulate, linear to lanceolate, 3 mm long, 1-2 mm broad; corolla narrowly campanulate, white or purplish, 1.5-2.9 mm broad, shorter than the calyx; style 0.5-1 mm long, cleft at the apex; mature capsule exceeded by the accrescent calyx, seed usually 1, globose, 2-4 mm in diameter,

deeply pitted in rows; cucullus reduced, persistent. Type locality: Utah: Parley's Park.

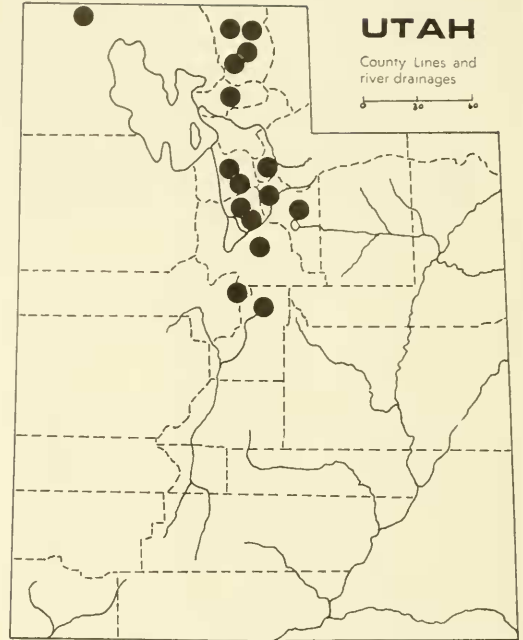
Great Basin, California, east to Colorado, north to Montana and southern British Columbia. Commonly associated as understory of aspen and maples in moist, rich soil.

Box Elder County: George Creek Canyon, Raft River Mountains, S. Preece, Jr. 954 (UT). Cache County: West Hodges Pastures, Logan Canyon, H. Passey s.n. (UTC); Wells-ville Canyon, C. Smith 2108 (UTC); Pine Canyon, B. Maguire 13757 (UTC); Blacksmith Fork Canyon, N. Holmgren 175 (UTC). Juab County: McCune Creek, Mt. Nebo, R. Gierisch s.n. (UTC). Salt Lake County: T. 1N., R2E, section 18, L. Arnow 1382 (BRY, UT); City Creek Canyon, S. Flowers s.n. (UT); Emigration Canyon, A. Garrett 2759 (UT); Wasatch Mountains, A. Garrett 2116 (UT).



Fig. 10. *Nemophila breviflora* A. Gray.

Utah County: Mt. Timpanogos, W. Cottam 1276 (BRY); right fork Hobble Creek Canyon, Springville, V. Livingston 7113 (BRY); Rock Creek, Provo, A. Garrett 3934 (UT); Pole Canyon R. Eastmond 57 (BRY); between American Fork Canyon and Snake Creek, S. Welsh, J. Murdock & D. Stocks 6343 (BRY). Wasatch County: Strawberry Valley, Mud Creek, V. Matthews 39 (BRY); Cascade Spring, S. Sanderson x5 (BRY). Weber County: northwest of Eden, A. Garrett & M. Milner 9385 (UT).



Map 13. Utah distribution of *Nemophila breviflora* A. Gray.

2. *Nemophila parviflora* Dougl. ex Benth.
var. *austinae* (Eastw.) Brand

Map 14

Nemophila parviflora Dougl. ex Benth. var. *austinae* (Eastw.) Brand, Pflanzenz. IV: 251: 55. 1913.

Nemophila inconspicua Henderson, Bull. Torr. Bot. Club 27: 349. 1900.

Nemophila austinae Eastwood, Bull. Torr. Bot. Club 28: 143. 1901.

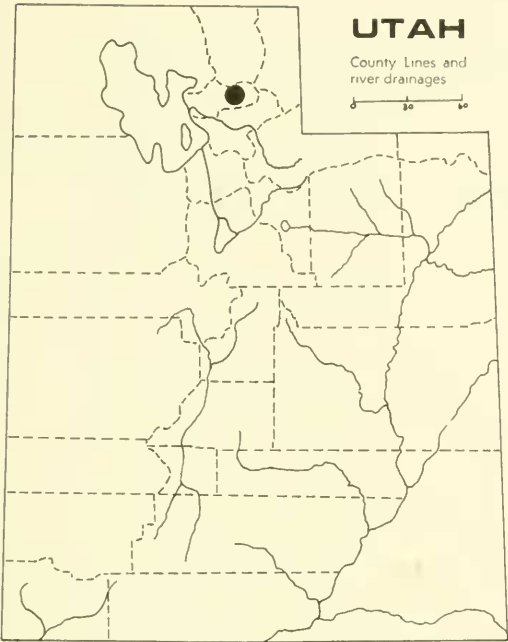
Nemophila explicata Nelson & Macbride, Bot. Gaz. 55: 377. 1913.

Nemophila parviflora Dougl. ex Benth. var. *typica* Brand subvar. *inconspicua* Brand, op. cit. p. 55.

Viticella parviflora Dougl. ex Benth. var. *austinae* Macbride, Contr. Gray Herb. 59: 32. 1919.

Stems obscurely angled, 0.5-3 dm long; leaves all opposite, 1-1.5 cm long, 2-2.4 cm broad, sparsely hispid; sepals lanceolate, auricles 0.2-0.4 mm long; corolla campanulate, white or bluish, 1.5-3 mm broad, barely exceeding the calyx; style 0.6-0.8 mm long, cleft ca $\frac{1}{2}$ its length; mature capsule exceeding the calyx; seeds mostly 2-4, ovoid, 2-2.5 mm long, shallowly pitted; cucullus deciduous. Type locality: "On David Creek, under trees, California."

Great Basin, California, north to southeastern Washington, Idaho, and Utah. Commonly present as understory in coniferous woodlands. Presently known only



Map 14. Utah distribution of *Nemophila parviflora* Dougl. ex Benth. var. *austinae* (Eastw.) Brand.

from Weber County, Utah. Restricted and local; possibly threatened. Weber County: summit of Little Bear River Canyon, B. Maguire 16371 (UTC).

8. *Phacelia* Juss. Scorpion Weed

Phacelia Juss., Gen. 129. 1789.

Plants herbaceous, annual, biennial or perennials, mostly pubescent and glandular; leaves mostly alternate, the lower sometimes opposite, entire to pinnately compound; flowers few to numerous in variously disposed scorpioid cymes, lax racemes; calyx divided nearly to the base; corolla tubular to broadly campanulate, blue, purplish, violet or white, mostly deciduous, a few species with a tardily deciduous corolla; stamens included or exerted, equally inserted at the base of the corolla-tube, with a pair of scales attached to the base of the corolla and filaments; style included or exerted, bifid, mostly pubescent; capsule unilocular, nearly bilocular by intrusion of the placentae; seeds 1 to numerous, variously roughened, boat-shaped, terete, angled or flattened. Type species: *Hydrophyllum magellanicum* Lam.

- 1a. Corolla yellow, withering-persistent and enclosing the mature capsule 2
- 1b. Corolla blue, lavender, violet or white (tube sometimes yellow), deciduous 3
- 2a. Style and branches 1-2 mm long; ovules 10-15; Tooele County and probably other counties in western Utah 32. *P. scopulina* A. Nels.
- 2b. Style and branches 1 mm long; ovules 7-9; Tooele County and probably elsewhere in Utah 30. *P. salina* (A. Nels.) J. T. Howell
- 3a. Seeds transversely corrugated, numerous 4
- 3b. Seeds not transversely corrugated or if so then the ventral surface of the seeds excavated on at least one side of a prominent ridge and with 2 ovules to each placenta 6
- 4a. Corolla 7-17 mm long, over twice the length of the calyx; Washington County 14. *P. fremontii* Torr. in Ives
- 4b. Corolla 2-4.5 mm long, shorter than to nearly equaling the calyx 5
- 5a. Stems with black capitate glandular heads, at least on the upper part of the stem; calyx-lobes spatulate; disjunct distribution in Tooele, Beaver, Washington, Kane, San Juan, and Grand counties; rare 1. *P. affinis* Gray
- 5b. Stems without black capitate glands, calyx-lobes linear to oblanceolate; scattered throughout most of Utah, except the northwest portion 21. *P. ivesiana* Torr. in Ives
- 6a. Seeds terete or angled and mostly foveolate or reticulate, but not excavated ventrally 21
- 6b. Seeds excavated on the ventral surface on one side or more often both sides of a prominent ridge (Crenulatae group) 7

- 7a. Stamens and style included or nearly so 8
 7b. Stamens and style exerted 2 mm or more 9
 8a. Plants brittle, breaking easily; corolla 3-4 mm long, pale mauve to light blue; mature seeds dark brown; to be expected in southwestern Utah 8. *P. coerulea* Greene
 8b. Plants not brittle; corolla 6 mm long; lavender or white; seeds brown; Washington County 4. *P. anelsonii* Macbride
 9a. Corolla small, 4 mm long or less, white, blue or lavender, the lobes erose; Sevier County, south to Wayne, Garfield and Washington counties 2. *P. alba* Rydberg
 9b. Corolla over 4 mm long, white or variously colored 10
 10a. Corolla tubular, pale colored 11
 10b. Corolla campanulate, purple, lavender or white (appearing tubular in some pressed specimens) 13
 11a. Seeds 3.5-4 mm long; cauline leaves sessile (or nearly so), auriculate; Emery, Wayne and Washington counties 28. *P. rafaelensis* Atwood
 11b. Seeds less than 3 mm long, black 12
 12a. Inflorescence thyrsoid; stems solitary or if branched then near the base; Washington and Iron counties 24. *P. palmeri* Torr. ex Wats.
 12b. Inflorescence open; stems branched throughout, especially at the base, Kane and San Juan counties 9. *P. constancei* Atwood
 13a. Leaves pinnately compound, finely dissected, mature seeds 2.4 mm long, excavated only on one side of the prominent ventral ridge; Utah County 5. *P. argillacea* Atwood
 13b. Leaves simple or if compound not finely so, the divisions broad (over 5 mm wide) 14
 14a. Corolla distinctly bicolored, the tube white or yellow, the lobes blue 15
 14b. Corolla not distinctly bicolored, blue, purple or white 17
 15a. Cauline leaves sessile, auriculate; plants robust, 0.8-5.8 dm tall, endemic to Sanpete and Sevier counties 35. *P. utahensis* Voss
 15b. Cauline leaves distinctly petiolate; plants not especially robust, less than 2.7 dm tall 16
 16a. Stems branched at base; leaves simple, strigose and glandular; corolla-tube white; seeds corrugated on the margins and ridge, dorsal surface smooth; Grand and San Juan counties 17. *P. howelliana* Atwood
 16b. Stems simple or branched above; leaves essentially glabrous; corolla-tube yellowish; seeds mostly lacking corrugations, dorsal surface deeply pitted; to be expected in Uintah and Grand counties 34. *P. splendens* Eastwood
 17a. Corolla lavender; seeds lacking ventral corrugations; Kane and San Juan counties 20. *P. integrifolia* Torr.
 17b. Corolla blue or purple; seeds corrugated ventrally 18
 18a. Mature seeds corrugated only on the ridge; pubescence of the stems densely hispid, glandular above; Washington County 3. *P. ambigua* Jones
 18b. Seeds with the margins and ridge corrugated; pubescence of the stems mostly glandular, sometimes finely so 19
 19a. Mature seeds dark brown; glandular pubescence long stipitate; western Utah 11. *P. crenulata* Torr. ex S. Wats.

- 19b. Mature seeds light brown or reddish; glandular pubescence short stipitate 20
- 20a. Anthers yellow; corolla deep blue, broadly campanulate; stems mostly branched throughout; seeds light brown; western Utah, east through central Utah to Colorado; northeastern and southern Utah except Washington County 10. *P. corrugata* A. Nels.
- 20b. Anthers the same color as the filaments; corolla light blue, the lobes not widely spreading; stems solitary or if branched then at the base; seeds reddish brown; endemic to the Tropic Shale, Dakota Sandstone and Kaiparowits formations in Kane and Garfield counties 23. *P. mammilarensis* Atwood
- 21a. Leaves pinnately compound, the divisions variously toothed 22
- 21b. Leaves entire to shallowly lobed or pinnate, the divisions entire 23
- 22a. Plants biennial or perennial; stems stout; seeds 8-18; corolla pelviform, marcescent; throughout most of the high mountain ranges 33. *P. sericea* (Graham) Gray
- 22b. Plants annual; stems weak, reclining; seeds usually 4; corolla broadly campanulate, deciduous; Washington County 36. *P. vallis-mortae* Voss
- 23a. Corolla campanulate to rotate or pelviform 24
- 23b. Corolla tubular or tubular-campanulate 28
- 24a. Plants biennial or perennial 25
- 24b. Plants annual 26
- 25a. Plants perennial; basal leaves mostly entire (sometimes with 1-2 lateral lobes; corolla white to lavender 15. *P. hastata* Dougl. ex Lehm. ssp. *hastata*
- 25b. Plants biennial or weakly perennial; basal leaves pinnately dissected with 1-4 lobe pairs; corolla white to yellow white 16. *P. heterophylla* Pursh ssp. *heterophylla*
- 26a. Filaments glabrous; seeds 2-4; sepals more or less glandular; capsule 3-3.5 mm long 6. *P. austromontana* J. T. Howell
- 26b. Filaments long hairy; seeds 6 or more; calyx-lobes not glandular; capsule 4-7 mm long 27
- 27a. Style and branches 2-3 mm long; stems 0.3-1.5 dm tall; corolla 4-6 mm long, campanulate; leaves mostly entire 12. *P. curvipes* Torr. in S. Wats.
- 27b. Style and branches 4.5-8 mm long; stems 1-5 dm tall, corolla 6-9 mm long, open-campanulate; leaves entire or with 1-4 lobes 22. *P. linearis* (Pursh) Holz.
- 28a. Ovules 8-16 per ovary 29
- 28b. Ovules 20 or more per ovary 31
- 29a. Leaves oblong to elliptic; style including branches 1.5 mm long; filaments glabrous; flowers in dense sessile clusters; Kane and Washington counties 7. *P. cephalotes* Gray
- 29b. Leaves broadly ovate to orbicular; style including branches 1.5-4 mm long; filaments sparsely hairy; flowers in racemes, these 1-4 cm long; Kane County, north to Carbon and Uintah counties 30
- 30a. Stems glandular-puberulent; style 1.5-2 mm long 13a. *P. demissa* Gray var. *demissa*
- 30b. Stems glandular-villous; style 2.5-4 mm long 13b. *P. demissa* Gray var. *heterotricha* J. T. Howell
- 31a. Corolla 8-14 mm long; style including branches 3.5-5 mm long; Garfield, Kane and Washington counties 27. *P. pulchella* Gray

- 31b. Corolla 8 mm long or less (mostly less); style and branches 3 mm long or less 32
- 32a. Stem pubescence finely glandular-puberulent 33
- 32b. Stem pubescence glandular-villous or glandular-hirsutulous or if glandular-puberulent then the leaves dentate to crenate 34
- 33a. Filaments glabrous; style and branches 2.5-3 mm long; corolla 3-4.5 mm long; San Juan and Wayne counties 19. *P. indecora* J. T. Howell
- 33b. Filaments sparsely hairy below; style and branches 1.5-2 mm long; corolla 5-6 mm long; to be expected in western Utah 25. *P. parishii* Gray
- 34a. Leaves coarsely toothed; seeds 60-100, 0.5 mm long 29. *P. rotundifolia* Torr. ex S. Wats.
- 34b. Leaves entire to repand, crenate or dentate; seeds 60 or less (if 60 then less than 0.5 cm long) 35
- 35a. Leaves dentate to crenate; style and branches 2-3 mm long; capsule 4-6 mm long; seeds 40-50, 1-1.3 mm long; to be expected in Washington County 26. *P. peirsoniana* J. T. Howell
- 35b. Leaves entire; style and branches 1.5 mm long; capsule 2.5-4 mm long; seeds 22-37 or 60 per capsule, 1 mm long or less 36
- 36a. Corolla tubular, marcescent; seeds ca 60, 0.3-0.4 mm long, reticulate; to be expected in southern Utah 31. *P. saxicola* Gray
- 36b. Corolla tubular-campanulate, deciduous; seeds 22-37, 0.6-1 mm long, pitted; western Utah; Uintah County 18. *P. incana* Brand

1. *Phacelia affinis* A. Gray
Map 15

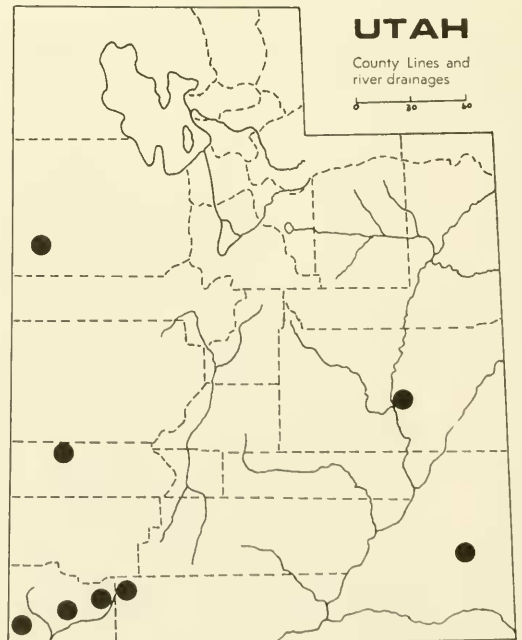
Phacelia affinis A. Gray. Syn. Fl. N. Amer. ed. 2.
2: 417. 1886.

Plants annual, 0.5-3 dm tall, puberulent and glandular, the glandular hairs with black, capitate heads; stems erect to spreading; leaves pinnately divided, oblong to lanceolate, 1-4 cm long; petioles to 4 cm long; inflorescence of elongate racemes, 1-4 cm long; sepals oblanceolate to spatulate, 3-4 mm long in flower and 6-10 mm long in fruit; corolla pale lavender or white with a pale yellowish tube, narrowly campanulate; stamens included, unequal, filaments glabrous; style included, 1-2 mm long; capsule 4-5 mm long; ovules 13-40; seeds ovate to oblong, ca 1 mm long, brown, reticulate and transversely corrugated. Type locality: Lower California.

Nevada, southern Utah, New Mexico, Arizona and California. Frequent in dry sandy soil of deserts and lower mountain areas from 3,000 to 5,000 feet elevation.

Grand County: Colorado River road, 1 mile E Moab Bridge, Deming 1-14 (nry). San Juan County: east slope of Elk Ridge, B. Maguire 2050 (UTC). Washington County: Beaver Dam Mountains, D. Atwood 1438 (nry);

below Anderson's Ranch, B. Maguire 1510 (UTC); mesa east of Hurricane, B. Maguire 1509 (UTC); Toquerville, B. Maguire 16339 (UTC); 2 miles W Hurricane, W. Cottam



Map 15. Utah distribution of *Phacelia affinis* A. Gray.

9874 (UT); Beaver Dam Mountains, A. Eastwood & J. T. Howell 9071 (UT).

2. *Phacelia alba* Rydberg

Fig. 11; Map 16

Phacelia alba Rydberg, Bull. Torr. Bot. Club 28: 30. 1901.

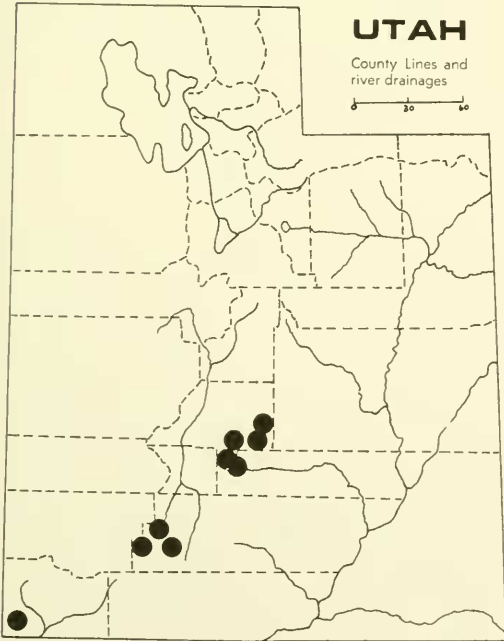
Phacelia neomexicana Thurber ex Torr. var. *alba* (Rydb.) Brand, Pflanzenr. IV. 251: 83. 1913.

Phacelia neomexicana Thurber ex Torr. var. *coulteri* (Greenman) Brand subvar. *foliosissima* Brand, Pflanzenr. IV. 251: 84. 1913.

Phacelia glandulosa Nutt. ssp. *eu-glandulosa* Brand var. *elatior* Brand, Pflanzenr. IV. 251: 82-83. 1913, in part.

Plants annual, 0.5-7 dm tall; stems simple to much branched, erect or ascending, leafy, puberulent, setose to hirsute and stipitate-glandular; leaves irregularly lobed to bipinnate, 2-10 cm wide, lower leaves long petiolate, upper leaves sessile or subsessile; inflorescence of dense terminal compound scorpioid cymes, densely glandular and puberulent to hirsute, the cymes 1-2 cm long in flower to 8 cm long in fruit; sepals linear to oblanceolate, 3.5-4 mm long; corolla campanulate, white (sometimes pale purple), 3-4 mm long and broad, the lobes pubescent and denticulate; capsule ovoid to subglobose, 3-3.3 mm long, puberulent and quite glandular;

mature seeds elliptic to oblong, light to dark brown, 2.4-3 mm long, uniformly alveolate throughout and cymbiform, the ventral surface shallowly excavated on both sides of the ridge and lacking corrugations, the margins thick and entire. Type



Map 16. Utah distribution of *Phacelia alba* Rydberg.

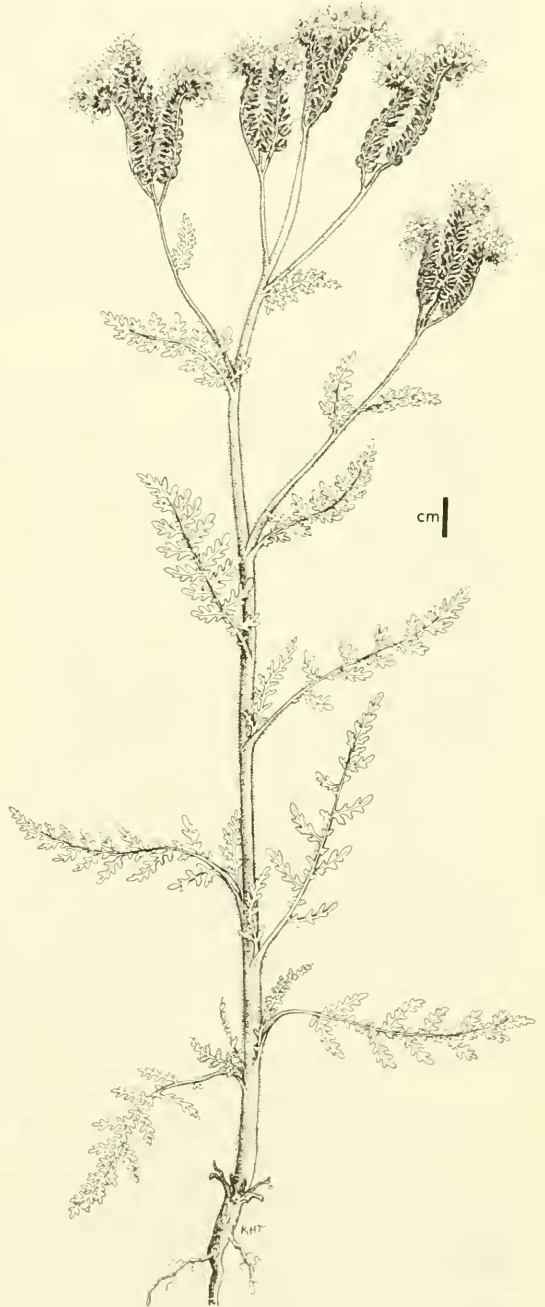


Fig. 11. *Phacelia alba* Rydberg.

locality: Costilla County, Colorado. Sangre de Christo Creek.

Southern Wyoming, south through central Colorado and New Mexico and adjacent Chihuahua, Mexico, west to Arizona and Utah. Dry clayloam or sandy draws and flats, fields, meadows, and gravelly hillsides. From 6,000 to 9,500 feet elevation, late May to early October.

Garfield County: Dixie National Forest, Gierisch 88 (UTC); Panguitch Lake, B. Maguire 18969 (CAS, UC, UTC); near Ruby, A. Eastwood & J. T. Howell 7159 (CAS); Panguitch, Eggleston 8157 (UTC). Sevier County: ca 15 miles N Fremont, S. Welsh & G. Moore 3547 (BRY); ca 6 miles S Fremont junction, S. Welsh et al. 9490 (BRY); Fish Lake, P. Rydberg & E. Carlton 7498 (GI, NY, RM). Washington County: southwest corner of Washington County, W. Cottam 8563 (UT). Wayne County: Loa, M. Jones 5639c (POM).

3. *Phacelia ambigua* Jones

Map 17

Phacelia ambigua Jones, Cont. West. Bot. 12: 52. 1908.

Phacelia crenulata Torr. var. *ambigua* (Jones) Macbride, Cont. Gray Herb. 49: 25. 1917.

Annual, 1.5-4 dm tall; stems erect, usually branching freely from the base,

hispid, puberulent, and stipitate-glandular; leaves simple to pinnately compound, 0.5-13 cm long, 0.5-4.5 cm wide, petiolate to sessile, strigose to hispid and stipitate-glandular; inflorescence of compound scorpioid cymes, the cymes elongating to 12 cm long in fruit, pubescence as for the stems; sepals elliptic to oblanceolate, 2.7-5.1 mm long, 1-1.3 mm wide, puberulent, hispid and stipitate-glandular; corolla campanulate to rotate-campanulate, purple or dull lavender, 4-10 mm long and broad, pubescent; stamens and style exerted 2-10 mm; style bifid, pubescent below; capsule globose to subglobose, 3-3.5 mm long, 2.5-3.4 mm wide, puberulent and glandular; mature seeds 4, ovate, reddish to brown, 2.5-3.3 mm long, 1.3-1.8 mm wide, alveolate, cymbiform, the ventral surface excavated on both sides of the ridge, the ridge corrugated on one side. Type locality: San Bernardino County, California, Needles.

Southern Nevada and southwestern Utah, east to Arizona, south to southeastern California. Lower Sonoran Desert from 490 to 5,000 feet elevation. February to mid-June.

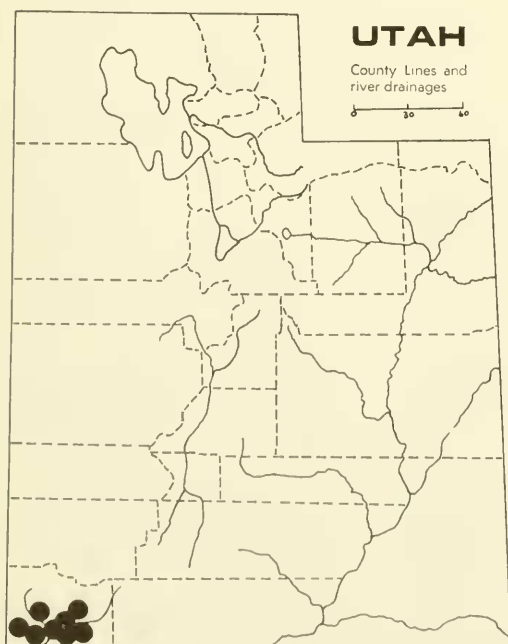
Washington County: St. George, F. Gould 1470 (NY, UC, UT); Terry's Ranch, L. Higgins 1224 (BRY); 2 miles W Virgin on highway 15, B. Wood 140 (BRY); Zion Canyon, M. Jones s.n. (US); 2 miles W Rockville, B. Maguire et al. 4938 (UTC); 5 miles SW Leeds, B. Maguire & H. Blood 1500 (UT, UTC); Middleton, R. Nisson s.n. (UT).

4. *Phacelia anelsonii* Macbride

Fig. 12; Map 18

Phacelia anelsonii Macbride, Contr. Gray Herb. 49: 26. 1917.

Erect annual, 1-5.5 dm high; stems terete, usually simple, covered with brownish stipitate glands, leafy throughout; leaves pinnately cleft, narrowly to broadly oblong, 1.5-8 cm long, with brownish stipitate-glandular and a few nonglandular hairs; inflorescence racemose to paniculate, usually terminal on the upper half of the stem, sometimes on leafy lateral branches, individual cymes 1-5 cm long, setose and glandular pubescent; sepals oblanceolate to spatulate, 3-6 mm long, 1-2 mm wide, setose to glandular, 1-2 mm longer than the capsule; corolla rotate to campanulate, light violet or white, 6 mm long and wide; stamens included, anthers yellow; style included, 3.5-4.8 mm long,

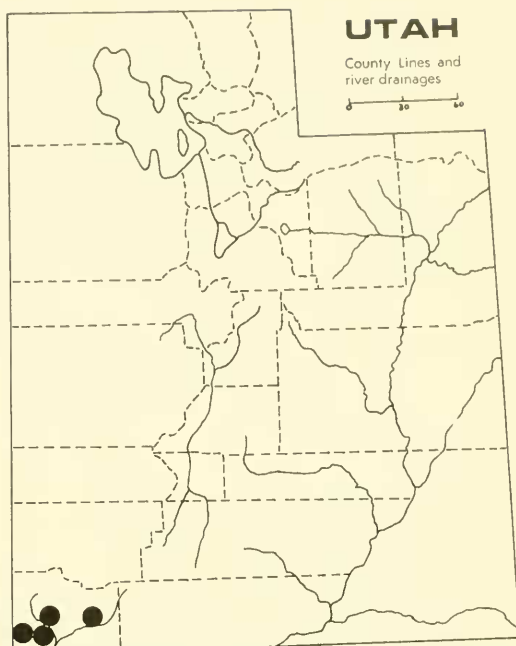


Map. 17. Utah distribution of *Phacelia ambigua* Jones.



Fig. 12. *Phacelia anelsonii* Macbride.

shorter than the stamens, cleft $\frac{2}{3}$ its length, glandular and puberulent at the base; capsule oval, 3.3-3.7 mm long, glandular spotted throughout and pilose on the upper half; mature seeds 4, oblong, 2.7-3.4 mm long, 1-1.3 mm wide, light brown, margins entire, ventral surface strongly alveolate, divided by a prominent ridge, the ridge corrugated along one side, dorsal surface alveolate. Type locality:



Map 18. Utah distribution of *Phacelia anelsonii* Macbride.

Lincoln County, Nevada, Meadow Valley, Wash.

Lincoln County, Nevada, south to Washington County, Utah, Inyo and San Bernardino counties, California. Commonly in shady places at the base of sandstone and limestone cliffs or among rocks and in sandy to gravelly washes, 2,000 to 5,000 feet. Restricted and local; threatened.

Usually locally scattered, April to May.

Washington County: west slopes of Beaver Dam Mountains, R. Barneby 2937 (CAS, RSA); ca 2 miles W Virgin, B. Wood 140 (BRY); Castle Cliffs, Beaver Dam Mountains, S. Welsh, D. Atwood & E. Matthews 9542 (BRY); Jackson road, Beaver Dam Mountains, L. Higgins 499 (BRY); Dixie State Park, L. Higgins 921 (BRY).

5. *Phacelia argillacea* Atwood

Map 19

Phacelia argillacea Atwood Phytologia 26(6): 437. 1973.

Plants annual or biennial, 1-3.6 dm tall; stems finely pubescent; leaves oblong, pinatifid, 0.8-5 cm long, 0.5-1.5 cm wide, strigose, petiolate; inflorescence of compound scorpioid cymes, stipitate-glandular and setose to hirsute, pedicels 0.7-1



Map 19. Utah distribution of *Phacelia argillacea* Atwood.

mm long, cymes up to 7.5 cm long in fruit; sepals elliptical to oblanceolate, 2-3.8 mm long, 1 mm wide, stipitate-glandular and hirsute or setose; corolla campanulate, blue to violet, ca 5 mm long and broad, the lobes pubescent; stamens and style exerted ca 7 mm; capsule subglobose, 3.2-3.3 mm long, 2.3-2.4 mm wide, glandular and setose; mature seeds 4, ovate to elliptic, 2.4 mm long, 1.1 mm wide, pitted, the ridge curved and more or less excavated along one side.

Type: Utah: Utah County: Clear Creek in Spanish Fork Canyon along railroad on the east side of highway 6-50, D. Atwood, K. Toft & J. Jefferies 3091 (HOLOTYPE: BRY; ISOTYPES: BRY, GH, NY, RM, UC, UT, UTC).

Additional collections examined: Utah: Utah County: Pleasant Valley Junction, Wasatch Mountains, August 1883, M. E. Jones s.n. (CAS, NY, POM, RM, UC, US, UTC); near Clear Creek at Soldier Summit, 6 July 1894, M. E. Jones 5591 (NY, POM, UC).

Known only from the type collections on the Greenriver Shale formation in Utah County, Utah. Endemic, rare, and endangered.

This species is related to *P. glandulosa* Nutt. and *P. bakeri* (Brand) Macbride, but is easily distinguished by its nearly glabrous herbage, smaller capsule and flowers. The seeds are smaller (2.4 mm long) and are excavated only on one side of the ventral ridge. The seeds of *P. bakeri* lack excavations on both sides of the ridge, whereas the seeds of *P. glandulosa* have excavations on both sides of the ridge. The glandular pubescence typical of *P. bakeri* and *P. glandulosa* is restricted to the inflorescence in *P. argillacea*.

6. *Phacelia austromontana* J. T. Howell

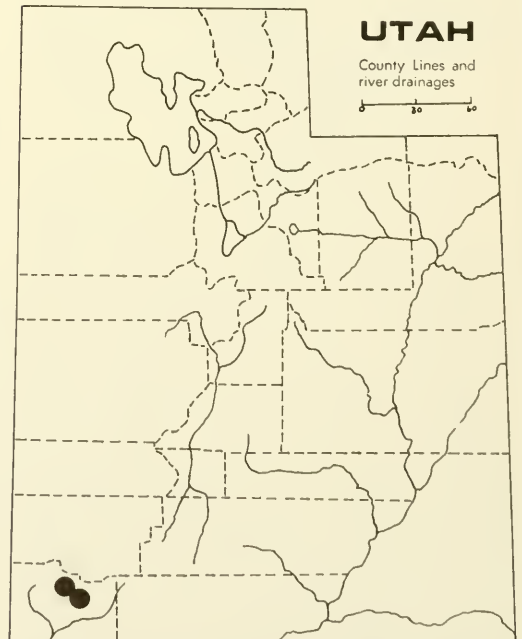
Fig. 13; Map 20

Phacelia austromontana J. T. Howell, Leaflet West. Bot. 3: 190. 1942.

Phacelia humilis Torr. & Gray var. *lobata* Davidson. Bull. S. Calif. Acad. Sci. 5: 61. 1906.

Phacelia lobata (Davidson) Jepson, Fl. Calif. 3: 253. 1943.

Annual, 0.5-2 dm tall; stems usually widely branched from the base, hirsute and glandular; leaves entire to few toothed to pinnately lobed, 1-3 cm long, linear, lanceolate or oblong, hirsute and glandular; inflorescence of few to many flowered racemes; sepals unequal, linear



Map 20. Utah distribution of *Phacelia austromontana* J. T. Howell.



Fig. 13. *Phacelia austromontana* J. T. Howell.

to oblanceolate, hirsute and glandular; corolla open campanulate, lavender or pale blue, 3-5 mm long; stamens ca equaling the corolla; style included, hairy at the base; capsule ovate, 3-3.4 mm long; seeds 2-4, light brown, 1.5-1.76 mm long, coarsely pitted. Type locality: Los Angeles County, California, South Fork Rock Creek, San Gabriel Mountains.

California, Nevada, and southwestern Utah. Sandy or rocky ground in the mountains above 6,000 feet. June to July.

Washington County: Oak Grove, Pine Valley Mountains, W. Cottam 8831 (UT); Oak Grove Camp, Pine Valley Mountains, H. Ripley & R. Barneby 4936 (CAS).

7. *Phacelia cephalotes* A. Gray

Fig. 14; Map 21

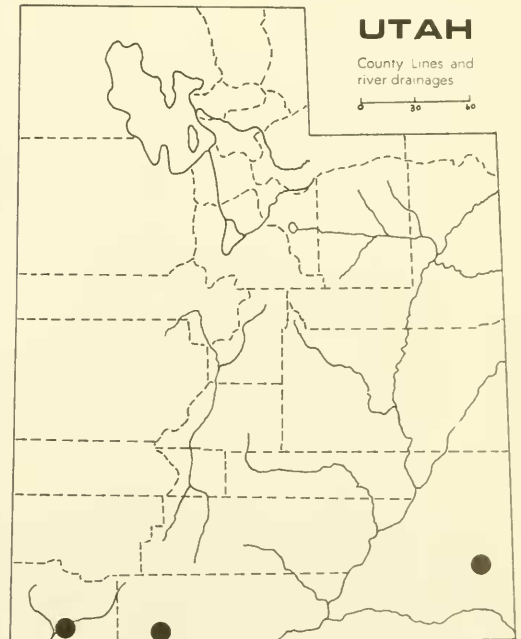
Phacelia cephalotes A. Gray, Proc. Amer. Acad. 10: 325. 1875.



Fig. 14. *Phacelia cephalotes* A. Gray.

Phacelia curvipes Parry, Amer. Nat. 9: 16. 1875. nomen nudum; not *P. curvipes* Torr.

Annual, 0.5-1.3 dm tall; stems low and widely branched from the base, glandular and villous; leaves entire, oblong to ovate, 0.5-1.8 mm long, hirsutulous and glandular; inflorescence of densely flowered racemes; sepals linear to oblanceolate, 3-10 mm long; corolla tubular, lavender, 4 mm



Map 21. Utah distribution of *Phacelia cephalotes* A. Gray.

long; stamens and style included; capsule ovate, 3-4 mm long; seeds 8-12, 1.3-1.5 mm long, oblong, angular, the angles denticulate, pitted. Type locality: Washington County, Utah, "Valley of the Virgin River."

Southern Utah, Navajo and Mohave counties, Arizona. Endemic to the Chinle formation. April to June. Restricted and local; possibly threatened.

Kane County: Chinle formation east of Kanab, D. Atwood 1798 (BRY); 1 mile E Kanab, B. Olsen 55 (BRY). Washington County: near Washington, A. Eastwood & J. T. Howell 9151 (UTC); St. George, M. Jones 1646 (UT, UTC).

8. *Phacelia coerulea* Greene

Fig. 15; Map 22

Phacelia coerulea Greene, Bull. Torr. Bot. Club 8(2): 122. 1881.

Phacelia invenusta Gray, Proc. Amer. Acad. 20: 303. 1885, in part.

Phacelia intermedia Wooton, Bull. Torr. Bot. Club 25: 257. 1898, in part.

Annual, 0.5-6 dm tall; stems erect, branched throughout, puberulent to setose and sparsely to densely stipitate-glandular, leafy throughout, leaves deeply sinuate to pinnatifid, oblong to ovate, strigose to glandular, margins crenate; inflores-

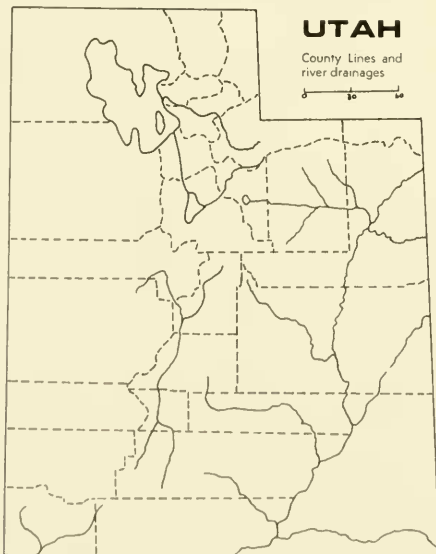


Fig. 15. *Phacelia coerulea* Greene.

cence terminal, commonly loosely panicle or cymose; sepals narrowly oblanceolate to elliptical, 2.5-4 mm long; corolla campanulate, lobes pale mauve to blue (turning white in fruit), tube yellowish, 3-4 mm long and broad; stamens mostly included, sometimes slightly exserted, anthers yellow, ovate, filaments bluish; style included to slightly exserted, equaling the stamens; capsule globose, 2.5-3.5 mm long; mature seeds dark brown, ventral surface pitted and divided by a prominent ridge, the ridge corrugated on one side, margins usually corrugated, dorsal surface pitted, 0.3-0.4 mm of the margin slightly elevated and smoother than the pitted center. Type locality: New Mexico, bluffs of the Gila.

Southern Nevada, southeastern California, east through Mohave County to southern Arizona and southern New Mexico from Socorro and Lincoln counties to El Paso, Presidio, and Brewster counties, Texas, and adjacent Mexico in the state of Chihuahua. Gravelly and arid calcareous hills and banks, sandy-gravelly stream beds and rocky ledges, 2,000 to 6,000 feet elevation. Late February to early July.

This species is to be expected in Washington County.



Map 22. Distribution near Utah of *Phacelia coerulea* Greene.

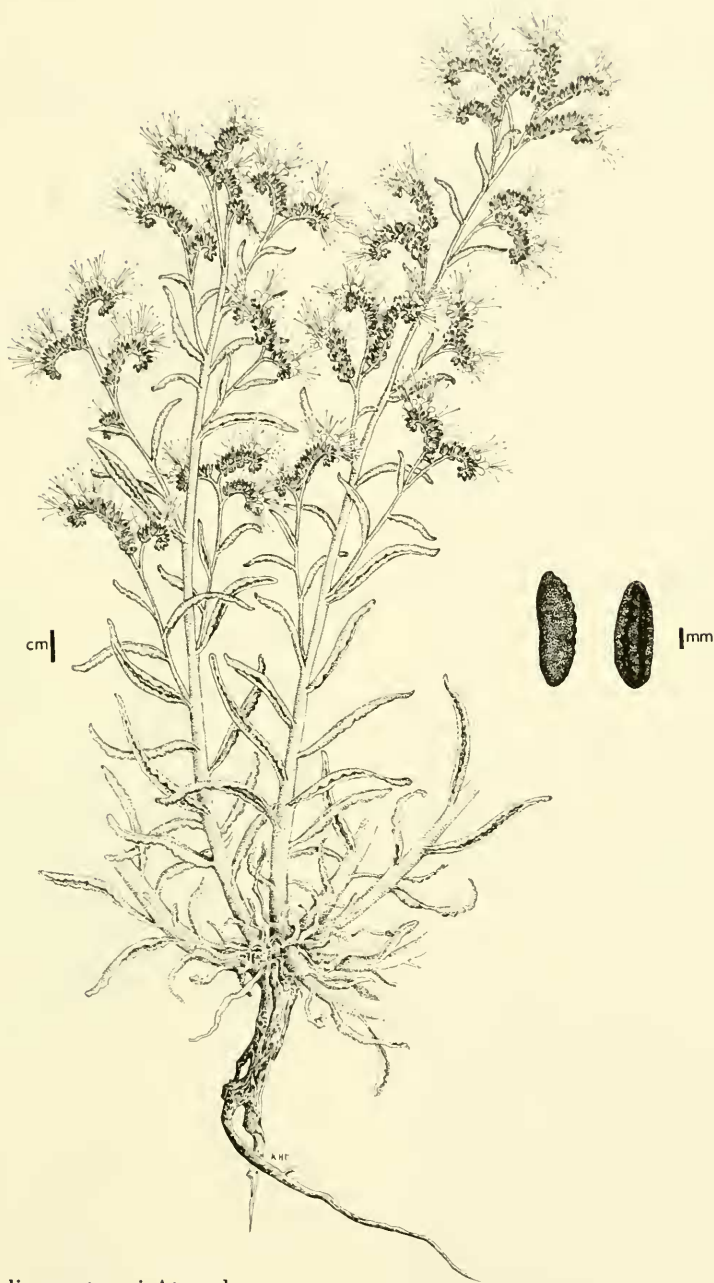


Fig. 16. *Phacelia constancei* Atwood.

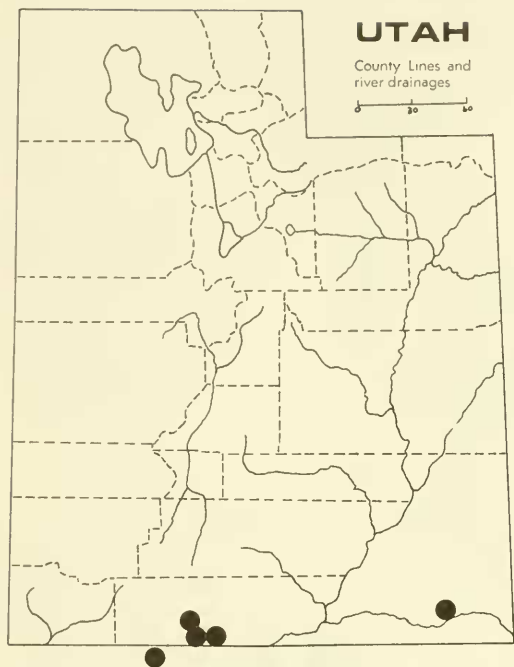
9. *Phacelia constancei* Atwood

Fig. 16; Map 23

Phacelia constancei Atwood, Rhodora 74(800): 451-468. 1972.

Erect biennial herb, 1.5-4.3 dm tall, leafy throughout; stems stout, simple or

branched throughout, reddish, hirsutulous to hirsute, and finely glandular; leaves undulate to pinnatifid, linear to lanceolate; inflorescence of compound scorpioid cymes; sepals elliptic to oblanceolate, 3-4 mm long; corolla tubular, whitish, 5-6 mm long; stamens exserted 3-4 mm longer



Map 23. Utah distribution of *Phacelia constancei* Atwood.

than the stamens; capsule subglobose, shorter than the sepals; mature seeds 4, black, 2.5-2.8 mm long, 1-1.2 mm wide, elliptic, the margins corrugated, ventral surface finely pitted, excavated and divided by a prominent ridge, the ridge corrugated on one side, the dorsal surface finely pitted. Type locality: Coconino County, Arizona, 1 mile north of Fredonia.

Mohave County, Arizona, east to Kane and San Juan counties, Utah. Alkaline clay bluffs and flats of the Moenkopi formation, 5,500 feet elevation. Late May to early August. Edaphically restricted and local; threatened.

Kane County: 19 miles E Kanab, H. Ripley & R. Barneby 4836 (CAS, RSA); 20 miles E Kanab, D. Atwood 1792B (BRY, CAS, GH, NY, POM, RM, US); ca 30 miles E Kanab, D. Atwood 1532 (BRY, CAS, GH, NY, US); 15 miles E Kanab, D. Atwood 1793A (ARIZ, BRY, US, UT); 3.7 miles E Skutumpah-Alton junction at the head of Johnston Canyon, D. Atwood 1801A (BRY). San Juan County: ca 7.5 miles E Bluff, D. Atwood 2467 (BRY).

10. *Phacelia corrugata* A. Nels.

Fig. 17; Map 24

Phacelia corrugata A. Nels., Bot. Gaz. 34: 26. 1902.

Phacelia crenulata Torr. ex S. Wats. var. *corrugata* (A. Nels.) Brand, Pflanzenr. IV. 251: 79. 1913.

Phacelia orbicularis Rydberg, Bull. Torr. Bot. Club 40: 479. 1913.

Plants annual or winter annual, 0.5-4.3 dm tall; stems greenish, puberulent to

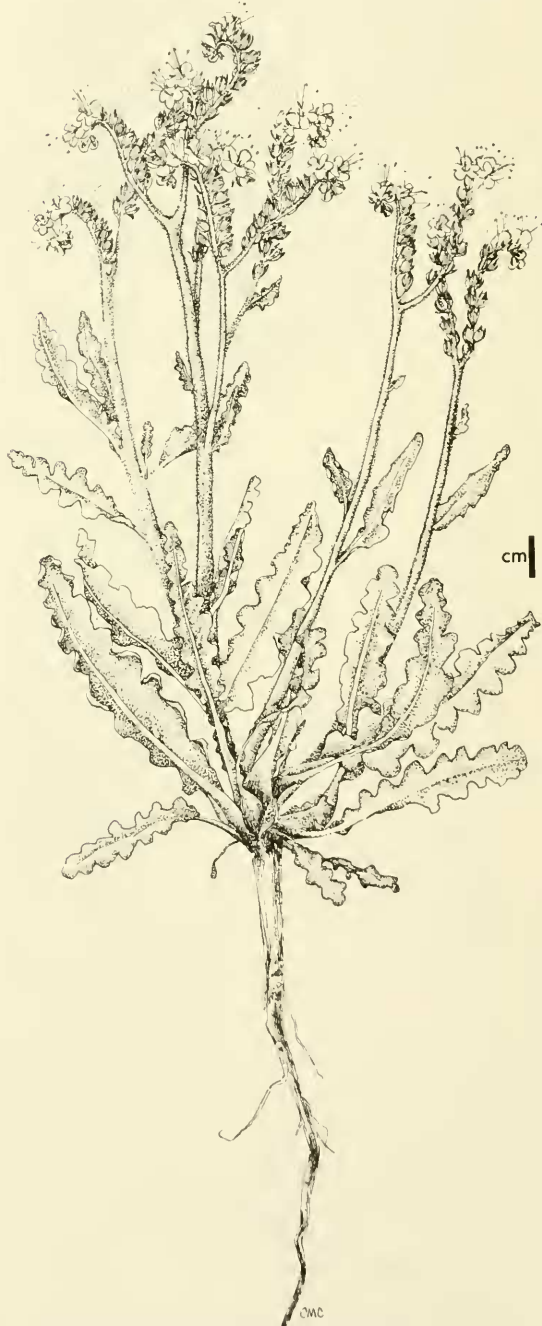
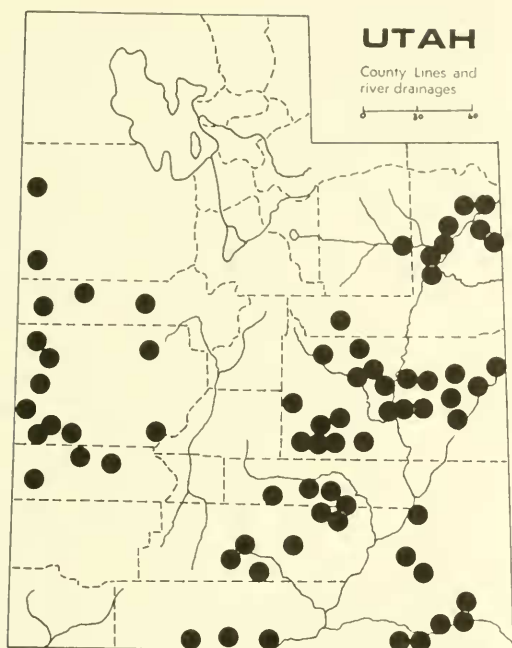


Fig. 17. *Phacelia corrugata* A. Nels.



Map 24. Utah distribution of *Phacelia corrugata* A. Nels.

finely stipitate-glandular, sometimes with a few longer hairs intermixed; leaves ovate to oblong, nearly entire to pinnately lobed, setose to strigose and stipitate-glandular; inflorescence of scorpioid racemes; sepals oblanceolate, 4-5.5 mm long, corolla campanulate, deep blue, 6 mm long or more; stamens and style exerted over 3 mm, filaments and style blue; capsule elliptic, 3.8-4.5 mm long; mature seeds oblong to elliptic, light brown, 3.1-4 mm long, 1.3-1.7 mm wide, pitted, the ventral surface corrugated on the margins and one side of the ridge. Type locality: Garfield County, Colorado, Rifle.

Eastern Nevada, east to Colorado in Garfield and Gunnison counties, south through Ouray and Montezuma counties to northwestern New Mexico and northern Arizona. This species grows in a large number of habitats, from dry gravelly hillsides and flats, sandy soil, red shaly clay to heavy clay soils, 3,500 to 7,000 feet. Late April to mid July.

Beaver County: Frisco, M. Jones 2030 (POM). Box Elder County: Desert Wash, W. Cottam 3150 (UT). Carbon County: Price slopes, R. Hardy, 13966 (UT); clay hills east of Wellington, H. Ripley & R. Barneby 8631 (CAS, NY); clay banks, Price, S. Flowers 56001 (UT). Duchesne County: ca 15 miles SW

Myton, J. Brotherson 740 (BRY); ca 7 miles S U.S. 40 along Utah 299, J. Brotherson 895 (BRY). Emery County: ca 4 miles S junction of Utah highway 24-U.S. 50-6, S. Welsh 3912 (BRY); ca 13 miles E Buckhorn Wash along road north of San Rafael River, Welsh & Atwood 9847 (BRY); ca 4 miles SW Temple Mountain, D. Atwood 1344 (BRY); 1.5 miles N Woodside, S. Flowers 2337 (UT); Greenriver, M. Jones s.n. (CAS, NY, RM, UT); ca 5 miles W junction 6-50/Huntington-Castledale road, D. Atwood 1329 (BRY); 3 miles E Greenriver, D. Atwood 1321 (BRY); 11 miles N Goblin Valley turnoff on Temple Mountain road from highway 24, D. Atwood 1856 (BRY); east of Greenriver, D. Atwood 1832 (BRY); 7 miles W Lawrence, D. Atwood 1836 (BRY). Garfield County: 24 miles SE Hanksville, C. Parry s.n. (CAS, UT); Grover, B. Harrison 9178 (BRY); east edge of Big Thompson Mesa, J. Peterson 50 (BRY); Escalante Mountains, W. Cottam 4437 (BRY); east side of Mt. Ellen, Henry Mountains, P. Standley s.n. (UT); Eggog Spring, Bullfrog Creek, S. Welsh 3980 (BRY). Grand County: between the Windows & Turret Arch, Arches National Monument, L. Anderson 63 (UTC); 10 miles E Greenriver, J. Pederson 11 (BRY); Thompson, M. Jones 2107 (BRY); near Cisco, C. Porter 2830 (CAS, RM, UTC); ca 1 mile NE Dewey, R. Vickery, Jr. 232 (UT). Juab County: volcanic hill north of Fumarole Butte, W. Cottam & C. McMillan 9641 (RSA, UT); Fish Springs, M. Jones s.n. (POM); 8 miles S Trout Creek, B. Maguire & R. Becraft 2750 (UTC). Kane County: bench north of Wahweap Marina, Welsh & Atwood 9771 (BRY); ½ mile W Paria River Bridge along highway 89, Welsh & Atwood 9744 (BRY); East Clark Bench 42 miles E Kanab, B. Harrison 12063 (BRY). Millard County: Cove Fort, W. Cottam 5098 (UT); R.18W., T.24S., section 25, H. Papenfuss, 17 (BRY); Desert Range Experiment Station headquarters, D. Atwood 1507 (BRY); Wah Wah Mountains, W. Cottam 7126 (UT); 25 miles SE Burbank, A. Eastwood & J. Howell 9358 (CAS, GH, UC, UTC); Detroit, M. Jones s.n. (POM); west end of Pine Valley, B. Maguire 20891 (NY); Gandy, O. Hare 130 (UTC). San Juan County: 2 miles E Bluff, A. Holmgren 3187 (UTC); 1.5 miles SW San Juan River Bridge southwest of Mexican Hat, A. Holmgren 3247 (NY, UTC); ca 7.5 miles W Bluff, D. Atwood 2465 (BRY); 25 miles S Blanding on highway 163, D. Atwood 2451 (BRY); ca 2 miles NW Oljeto Post, H. Cutler 2244 (CAS, GH, UC); south of Bloomfield, H. Ripley & R. Barneby 8383 (CAS); Virginia Park, G. Moore 315 (BRY). Sevier County: south of Kooshaream Reservoir, D. Atwood 1370 (BRY). Tooele County: near Wendover, W. Cottam 7098 (UT); Ibapah, W. Cottam 3150 (BRY, CAS). Uintah County: 8 miles S Ouray, R. Rollins 1696 (CAS, GH, NY, RM); Chepeta Well, M. Jones, s.n. (POM); Hill Creek ca 12 miles S Ouray, J. Brotherson 546 (BRY); near Dinosaur National Monument headquarters, C. Porter 5298 (GH, RM); Throne Ranch, Willow Creek, D. At-

wood 1563 (BRY); 6 miles N Jensen, W. Weber 5370 (UC); 20 miles S Vernal, E. Graham 6182 (US). Wayne County: 1.5 miles NW Fairview Ranch north slopes of Henry Mountains, B. Harrison 11178 (BRY); Grover, B. Harrison 9178 (BRY); east of Torrey, H. Ripley & R. Barneby 8618 (CAS, NY); 5 miles E Torrey, B. Maguire 18101 (UTC); 9 miles N Greenriver, B. Maguire 18231 (UTC); 3 miles W Hanksville, Atwood & Higgins 1833 (BRY).

11. *Phacelia crenulata* Torr. in S. Wats.
Map 25

Phacelia crenulata Torr. in S. Wats., Bot. King Exped. 251. 1871.

Phacelia crenulata Torr. in Wats. var. *vulgaris* Brand, Pflanzenzr. IV. 251: 78. 1913.

Plants annual, 0.25-8.3 dm tall; stems 1-several, simple or branched, puberulent, pilose, setose or hispid, and stipitate-glandular, reddish purple to green; leaves sessile to petiolate, 0.4-1.2 dm long, 0.5-4 cm wide, stigose to setose or hispid and stipitate-glandular; inflorescence of compound scorpioid cymes; sepals elliptic to oblanceolate, 3-5.3 mm long, 1-1.4 mm wide, setose to hispid and stipitate-glandular; corolla campanulate to rotate-campanulate, blue, pale purple or violet, pubescent, 4.5-7 mm long and broad; stamens and style exserted 5.5-11 mm; style

bifid 3/4 its length, glandular pubescent below; capsule globose to subglobose, 2.6-4.1 mm long, 2.3-3.2 mm wide, puberulent and glandular; mature seeds 4, elliptic to oblong, 2.8-3.6 mm long, 1.2-2 mm wide, the ventral surface corrugated.

Nevada, east to western and southern Utah (except Washington County), south to Mohave and Coconino counties, Arizona, and eastern California from Nevada County south to San Bernardino County. Rock slides, limestone talus, lava flows, gravelly and sandy soil of the foothills and canyons, from 4,600 to 8,000 feet elevation. Late February to early July. Restricted in disjunct populations.

Garfield County: Mt. Ellen, A. Garrett 5579 (BRY); Dog Valley, H. Ripley & R. Barneby 4781 (CAS, RSA). Kane County: ca 30 miles E Kanab, D. Atwood 1532B (BRY); Tippet Canyon N Glen Canyon City, D. Atwood 3603 (BRY); Cedar Mountain S Glen Canyon City, D. Atwood 3612 (BRY). Tooele County: Wendover, E. Van Dyke s.n. (CAS). Wayne County: at mile post 21 south of Hanksville, Welsh & Moore 7102A (BRY).

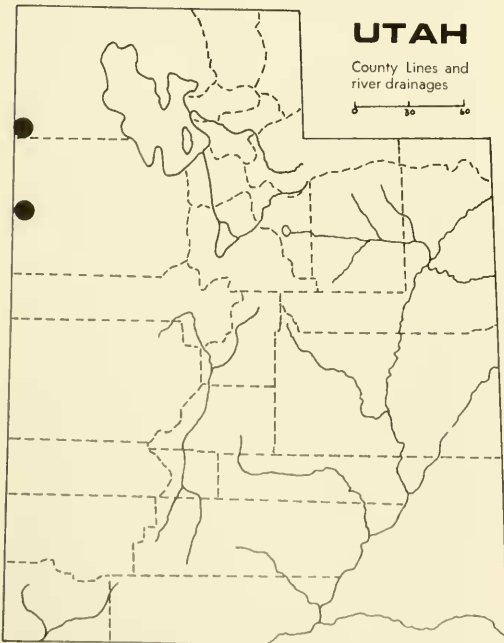
12. *Phacelia curvipes* Torr. in S. Wats.

Fig. 18; Map 26

Phacelia curvipes Torr. in S. Wats., Bot. King Expl. 252. 1871.

Phacelia curvipes Torr. in Wats. var. *eu-curvipes* Brand, Univ. Calif. Publ. Bot. 4: 222. 1912.

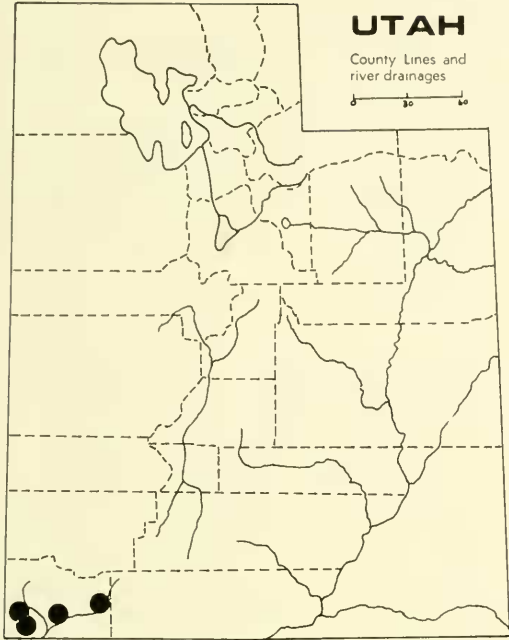
Plants annual, 3-15 cm tall, stems diffuse or ascending, hirsute and hirsutulous,



Map 25. Utah distribution of *Phacelia crenulata* Torr.



Fig. 18. *Phacelia curvipes* Torr.



Map 26. Utah distribution of *Phacelia curvipes* Torr.

lacking glandular hairs; inflorescence of terminal racemes, these with scattered capitate glands; leaves linear to oblanceolate, 1-4 cm long, entire or rarely with a small lobe near the base, petiole to 2 cm long; sepals linear to oblanceolate, 3-10 mm long; corolla campanulate, lavender to pale violet, 4-6 mm long, tube whitish; stamens included; style included, long-hairy near the base; capsule ovoid, 4-5 mm long, flattened; seeds 6-17, ovate, ca 1 mm long, coarsely pitted, brown. Type locality: Washoe County, Nevada, foothills near Carson and Washoe cities and on the Trinity Mountains.

Central Nevada, south to southern California and southwestern Utah. Mountain slopes and foothills, 4,000 to 8,000 feet.

Washington County: Welcome Springs, Beaver Dam Mountains, B. Maguire 20553 (UTC); Clear Creek Canyon, Zion Park, A. Eastwood & J. Howell 9233 (UTC); near Anderson's Ranch, H. Blood 1505 (UTC); summit Beaver Dam Mountains, D. Atwood 1439 (BRY, CAS); ca 3 miles SW Television Relay Tower, Beaver Dam Mountains, L. Higgins 880a (BRY).

13. *Phacelia demissa* A. Gray

Phacelia demissa A. Gray, Proc. Amer. Acad. 10: 326. 1875.

Plants annual, 0.3-2 dm tall; stems erect or ascending, glandular, puberulent or villous; leaves broadly ovate to orbicular, 1-2.6 cm long, mostly near the ends of the branches, entire to undulate; inflorescence of terminal or axillary, sessile racemes; sepals linear, oblong to lanceolate, 5-6 mm long; corolla tubular to narrowly campanulate, 5-8 mm long, lavender or purplish, the tube pale yellow; stamens included; style included, hairy below; capsule oblong, 3-4 mm long; seeds 10-16, ovate to oblong, 1-1.5 mm long, brown.

13a. *Phacelia demissa* A. Gray var. *demissa*

Map 27

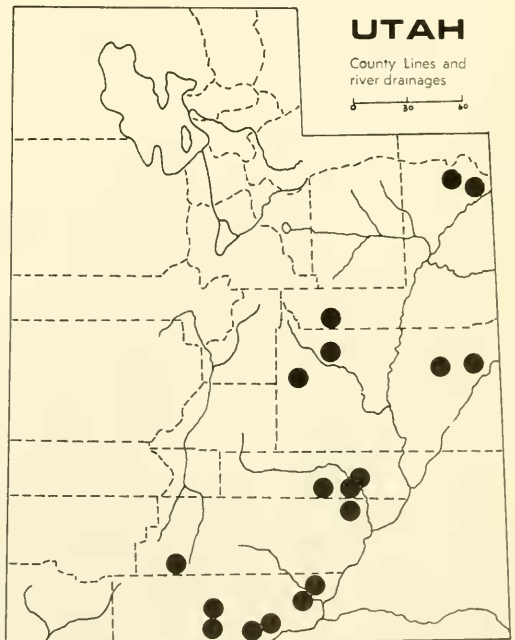
Phacelia demissa A. Gray var. *demissa*

Phacelia demissa Gray, l. c

Phacelia nudicaulis Eastwood, Zoe 4: 123. 1893.

Phacelia knighti A. Nels., Bull. Torr. Bot. Club 28: 229. 1901.

Upper stems glandular-puberulent; lower internodes naked, elongating to 6 cm; leaves mostly clustered at the ends of the branches; style 2 mm long or less. Type locality: New Mexico, type collection without data, and questionable as from New Mexico.



Map 27. Utah distribution of *Phacelia curvipes* Torr.

Southern Wyoming, south to Utah and northern Arizona. Mostly confined to the Mancos and Tropic Shale formations, March to August.

Carbon County: 2 miles E Wellington, S. Flowers 8021 (BRY); Wellington, Cottam & Hutchings 2028 (BRY). Emery County: 2 miles S Ferron, no collector, 4738 (UTC); 7 miles W Lawrence, D. Atwood 1837 (BRY). Garfield County: 2 miles N Hanksville, H. Ripley & R. Barneby 8591 (UTC); 1 mile E Henrieville, D. Atwood 1875 (BRY); R.10E., T36S., J. Pederson 28 (BRY). Kane County: ca 4 miles N U.S. 89 on Cottonwood Wash Road, D. Atwood & R. Allen 2762 (BRY); 10.5 miles E Glen Canyon City, D. Atwood 2634 (BRY); 4 miles W Hole-in-Rock, N. Holmgren & J. Reveal 2037 (BRY, UTC); 15 miles W Glen Canyon City and 4 miles S on dirt road, D. Atwood & R. Allen 2864 (BRY). Uintah County: Orchard Creek, Dinosaur National Monument, S. Welsh 159 (BRY); 2.5 miles N Brush Creek Sheep Pens on old Diamond Mountain road, D. Atwood 1596 (BRY). Wayne County: 28 miles SW Hanksville, A. Cronquist 9179 (UTC).

13b. *Phacelia demissa* A. Gray var. *heterotricha* J. T. Howell

Map 28

Phacelia demissa A. Gray var. *heterotricha* J. T. Howell, Amer. Midl. Natur. 29: 8. 1943.

Upper stems glandular-villous; lower internodes leafy ca 3.5 cm long; style 3-4

mm long. Type locality: Sevier County, Utah, Marysville.

Sevier and Wayne counties, Utah. Sandy or clay flats. Endemic, restricted, and possibly threatened.

Sevier County: Marysville Canyon, L. Arnow 22 (UT); 2 miles N Elsinore, J. Reveal et al. 733 (BRY). Wayne County: 12 miles W Hanksville, D. Atwood 1361a (BRY); 15 miles W Hanksville, D. Atwood 1362 (BRY).

14. *Phacelia fremontii* Torr. in Ives

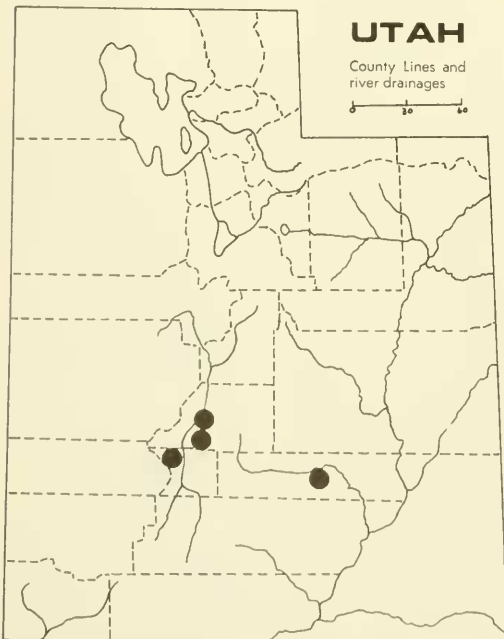
Fig. 19; Map 29

Phacelia fremontii Torr. in Ives' Colo. River Explor. Exped. Bot. 21. 1860.

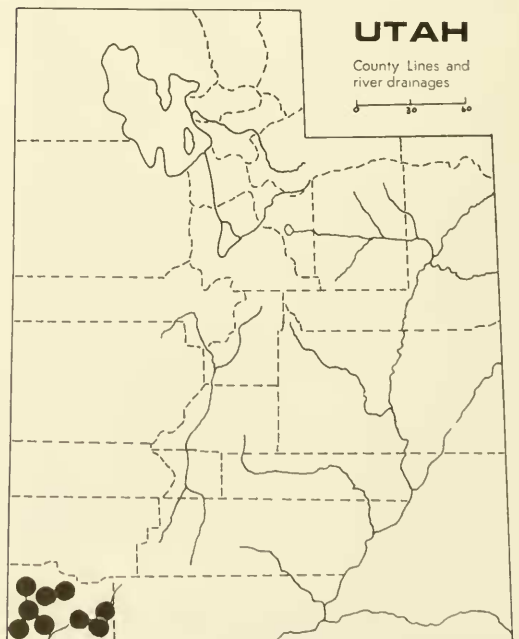
Phacelia brannani Kell., Proc. Calif. Acad. Sci. 7: 90. 1877.

Phacelia hallii Brand, Jahresb. Kgl. Gymnas. Sorau Beilage 8. 1911.

Annual, 1-3 dm tall; stems several to numerous, ascending, puberulent to hirsutulous, retrorsely hairy below, somewhat glandular above; leaves pinnately divided, 2-6 cm long, hirsutulous, mostly basal; inflorescence of many dense terminal cymes; sepals linear to oblanceolate, 4-9 mm long, glandular and hirsutulous; corolla funnelform to campanulate, the lobes lavender to blue, 6-16 mm long, the tube yellow; stamens included, unequal; style included; capsule oblong, 5-6 mm long,



Map 28. Utah distribution of *Phacelia demissa* A. Gray var. *heterotricha* J. T. Howell.



Map 29. Utah distribution of *Phacelia fremontii* Torr.



Fig. 19. *Phacelia fremontii* Torr.

hirsutulous and minutely glandular; seeds ca 12-40, oblong or ovate, ca 1 mm long, brown, corrugated. Type locality: Arizona, Yampai Valley.

California and Nevada, east to Utah and Arizona. Sonoran Zones on hills and plains, March to May.

Washington County: Zions Canyon, W. Cottam 4787 (BRY); 1 mile S Relay Station, Beaver Dam Mountains, D. Atwood 1448 (BRY); Apex Mine, W. Cottam 4712 (BRY); ca 5 miles N Gunlock, S. Welsh & G. Moore 6833 (BRY); Diamond Valley, L. Higgins 4198 (BRY); mesa E Hurricane, F. Wann 1511 (UTC); St. George, M. Jones 1610 (UTC); 4 miles W Springdale, M. Gaufin & A. Cronquist s.n. (UTC); between Pine Valley and Central Wash, W. Cottam 6828 (UT).

15. *Phacelia hastata* Dougl. ex Lehm.
ssp. *hastata*
Fig. 20; Map 30

Phacelia hastata Dougl. ex Lehm. ssp. *hastata*, Univ. Calif. Publ. Bot. 32(1): 80-88. 1960.
Phacelia hastata Dougl. ex Lehm., Stirp. Pug. 2: 20. 1830.

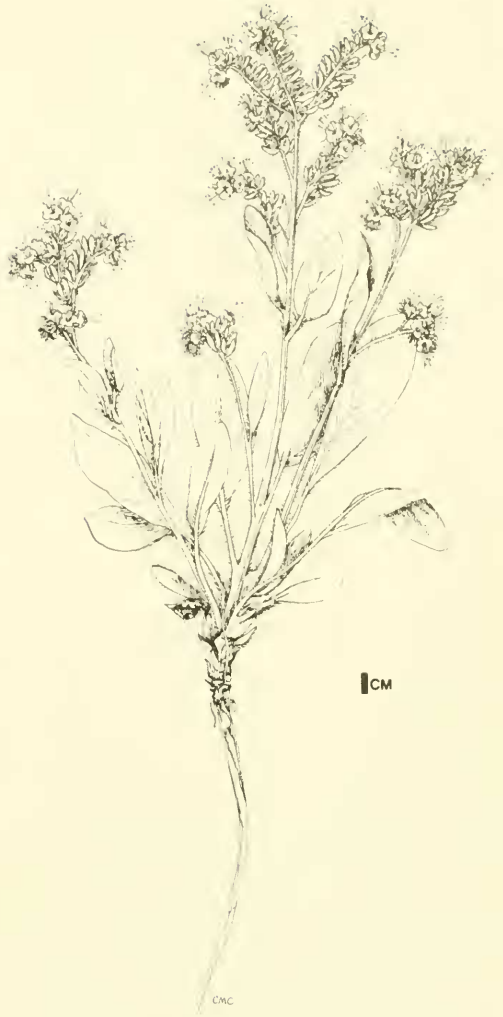
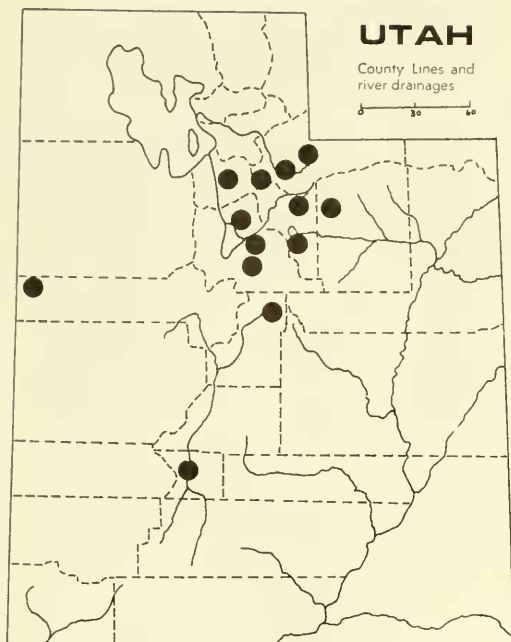


Fig. 20. *Phacelia hastata* Dougl. ex Lehm. ssp. *hastata*.

Phacelia leucophylla Torr. in Frem., Fremont Report 89. 1943.
Phacelia hastata var. *leucophylla* (Torr.) Cronq. in Hitchc. et al., Univ. Wash. Publ. Biol. 17: 164. 1959.
Phacelia canescens Nutt., Jour. Acad. Phila. ser. 2, 1: 159. 1848.
Phacelia biennis Nels., Bull. Torr. Bot. Club 26: 132. 1899.
Phacelia alpina Rydb., Mem. N.Y. Bot. Gard. 1: 324. 1900.
Phacelia heterophylla Pursh var. *alpina* (Rydb.) Nels. in Coult. & Nels., New Man. Bot. Rocky Mts. 408. 1909.
Phacelia leucophylla Torr. var. *alpina* (Rydb.) Dundas, Bull. So. Calif. Acad. 33: 165. 1935.
Phacelia hastata Dougl. ex Lehm. var. *alpina* (Rydb.) Cronq. in Hitchc. et al., Univ. Wash. Publ. Biol. 17: 164. 1959.



Map 30. Utah distribution of *Phacelia hastata* Dougl. ex Lehm. ssp. *hastata*.

Phacelia leucophylla Torr. var. *suksdorfii* Macbride, Contr. Gray Herb. 49: 34. 1917.

Plants perennial, 2-4.5 dm high; stems one to several, erect, strigose and hispid; leaves entire or sometimes with 1-2 lateral pairs of lobes near the base of the leaf, lanceolate to ovate or oblanceolate, with a well-developed basal rosette; inflorescence of scorpioid racemes or panicles; sepals linear to lanceolate, 3-6 mm long, strigose and hirsute; corolla campanulate, white to lavender, 4-6 mm long; stamens exserted, filaments hairy at the middle; style exserted, pubescent at the base; capsule ovoid, ca 3 mm long; seeds 1-2, oblong, 2-2.6 mm long, brown. Type locality: plains of the Columbia.

British Columbia and Alberta, south to Colorado and Utah, west to California, Oregon, and Washington, east to North and South Dakota and Nebraska. Sandy to rocky ground of the foothills and mountains. June to August.

Duchesne County: head of Blind Stream Creek, B. Harrison & A. Hisson 8812 (BRY); Hades Creek, E. Snow s.n. (BRY); Granddaddy Lakes Basin west of Thesis Lake, H. Stutz 2065 (BRY). Juab County: Sheba Mine, Deep Creek Mountains, W. Cottam 3207 (BRY). Piute County: ca 4 miles W Marysville, D. Atwood 3042 (BRY). Sanpete County: 5 miles

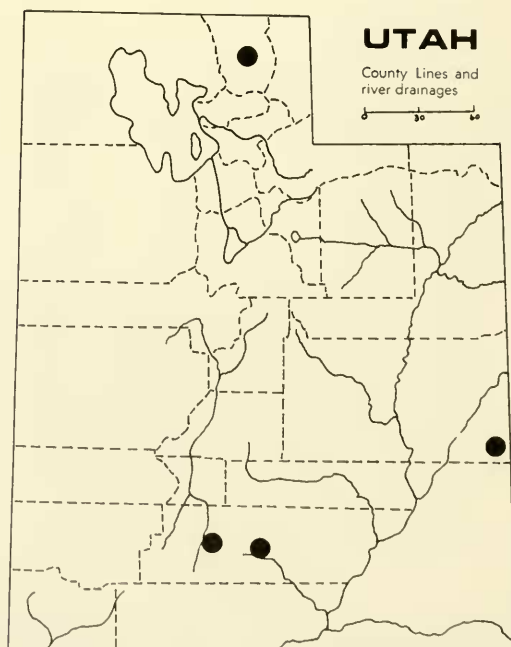
N Fairview Canyon Wasatch Mountains, J. Leetham 14 (BRY). Salt Lake County: Little Cottonwood, W. Cottam & Biddaluph 3229 (BRY); South Fork Mill Creek, E. Robison s.n. (UT). Summit County: head of Provo River, Cottam & Biddaluph, 3636 (BRY); Bald Mountain Pass, E. Devenport, ECD 45 (BRY); Lily Lake northwest of Trial Lake, D. Atwood 1540 (BRY); ca 3 miles E Mt. Elizabeth Ridge, north slope Uinta Mountains, S. Welsh, G. Moore & E. Matthews 9158 (BRY). Utah County: American Fork Canyon, I. Diehl s.n. (BRY); junction of US 50-6 & Utah 96, S. Welsh, D. Atwood & G. Moore 10765 (BRY); mouth of Rock Canyon, W. Cottam 442 (BRY). Wasatch County: Wolf Creek Pass, Wolf Creek, S. Welsh 3445 (BRY); 5 miles SE Strawberry Reservoir along U.S. 40, W. Patrick 131 (BRY).

16. *Phacelia heterophylla* Pursh

Map 31

Phacelia heterophylla Pursh, Fl. Amer. Sept. 140. 1814.

Plants perennial, 2-11 dm tall; stems simple, erect, leafy, strigose to hispid; leaves pinnately dissected, 0.5-1 dm long, with a basal rosette; inflorescence paniculate, pilose to hispid; sepals lanceolate to oblong, 3-6 mm long, unequal; corolla campanulate, white to pale yellow, 4-7 mm long; capsule ovoid, 2-3 mm long, pubescent; seeds 1-2, 2-2.5 mm long,



Map 31. Utah distribution of *Phacelia heterophylla* Pursh.

brown. Type locality: Idaho, Clearwater River.

Montana, south to Mexico, west to Oregon and Washington. From near sea level to 10,500 feet on rocky or sandy slopes and hillsides. This species is closely related to *P. hastata* Dougl. ex Lehm. and is difficult to distinguish from it in most cases. Therefore, only a few representative specimens are cited. Additional work is needed in order to determine their relationships, distribution, and taxonomic delimitation of subspecific taxa.

Cache County: Providence Cemetery boundary. B. Maguire 13766 (UTC). Garfield County: Blue Spruce Camp, Aquarius Plateau, B. Maguire 19191 (UTC); Posey Lake 15 miles N Escalante, N. Holmgren, J. Reveal & C. La France 2435 (UTC). Grand County: 1/2 mile N Warner Ranger Station, B. Maguire, et al. 16344 (UTC).

17. *Phacelia howelliana* Atwood

Fig. 21; Map 32

Phacelia howelliana Atwood, *Rhodora* 74 (800): 456. 1972.

Plants annual, 0.9-2.3 dm tall; stems mostly branched and leafy toward the base, glandular and hirsute; leaves broadly oblong to oval, 2-6 cm long, 1-2.5

cm wide, irregularly crenate to lobed, strigose and slightly glandular, the petiole up to 5 cm long; inflorescence of compound scorpioid cymes; pedicels up to 2 mm long; sepals linear to narrowly oblanceolate, 3.5-4.5 mm long, 1-1.2 mm wide, glandular and hirsute; corolla 5-6 mm long, 6-7 mm wide, rotate to funnel-form, the lobes light violet to blue, the tube white; stamens and style exerted 3-4 mm, style shorter than the stamens, bifid 3/4 its length, lower 1/4 pubescent; capsule oblong to subglobose, glandular and hirsutulous, especially toward the apex; seeds 4, brown, 3.2-4 mm long, 1.4-1.8 mm wide, elliptical, the margins corrugated, involute to flattened, ventral surface pitted, excavated and divided by a prominent ridge, the ridge sometimes curved to one side and barely corrugated, dorsal surface reddish brown, smooth and surrounded by a lighter margin.

Known only from San Juan and Grand counties, Utah. The species probably occurs in Colorado near Moab and also in Monument Valley in Arizona, red sandy, gravelly or clay soils, 4,500 to 5,000 feet. April to June. Endemic to Utah.

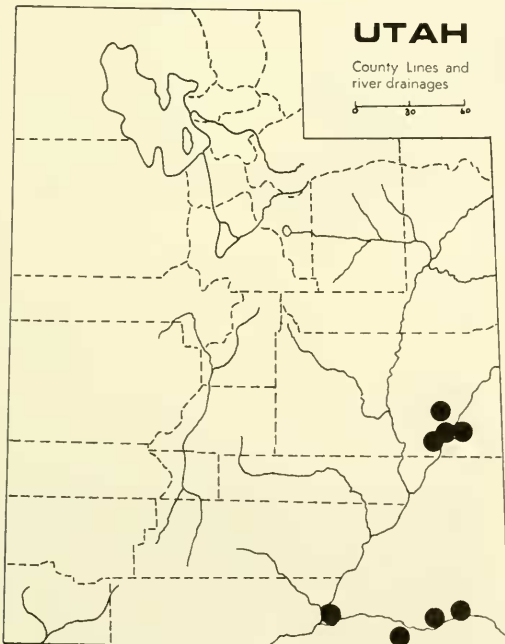
Grand County: 13 miles N Moab, A. Holmgren & S. Hansen 3319 (NY); Castle Valley, S. Welsh, D. Atwood & G. Moore 9957 (BRY); Moab, A. Eastwood s.n. (NY); Arches National Monument, G. Pyrah *et al.* 71 (BRY). San Juan County: Bluff, D. Bright 55 (BRY); Bluff, M. Jones s.n. (POM); west of Monument Valley Hospital, D. Atwood 2511 (BRY, UT, UTC); 4 mile N Bluff, D. Atwood 2454 (BRY); Goulding, J. T. Howell 24687 (CAS); Canyon of the San Juan River between Bluff and Colorado River, P. Thompson s.n. (CAS); Cataract Canyon, E. Clover & M. Jotter 2143a (GH).

18. *Phacelia incana* Brand

Fig. 22; Map 33

Phacelia incana Brand. Beil. Jahresb. Kgl. Gymnas. Sorau. 8. 1911.

Plants annual, 0.5-1.5 dm tall; stems branching from the base, and upward, glandular and villous; leaves elliptic to ovate, entire, 1-1.4 cm long; inflorescence of elongate racemes, these laxly flowered (at least below); sepals linear to spatulate or oblanceolate, 3.5-6 mm long, glandular and hirsute; corolla narrowly campanulate, white to pale lavender above, the tube yellowish; stamens included, filaments hairy at the base; style included,



Map 32. Utah distribution of *Phacelia howelliana* Atwood.

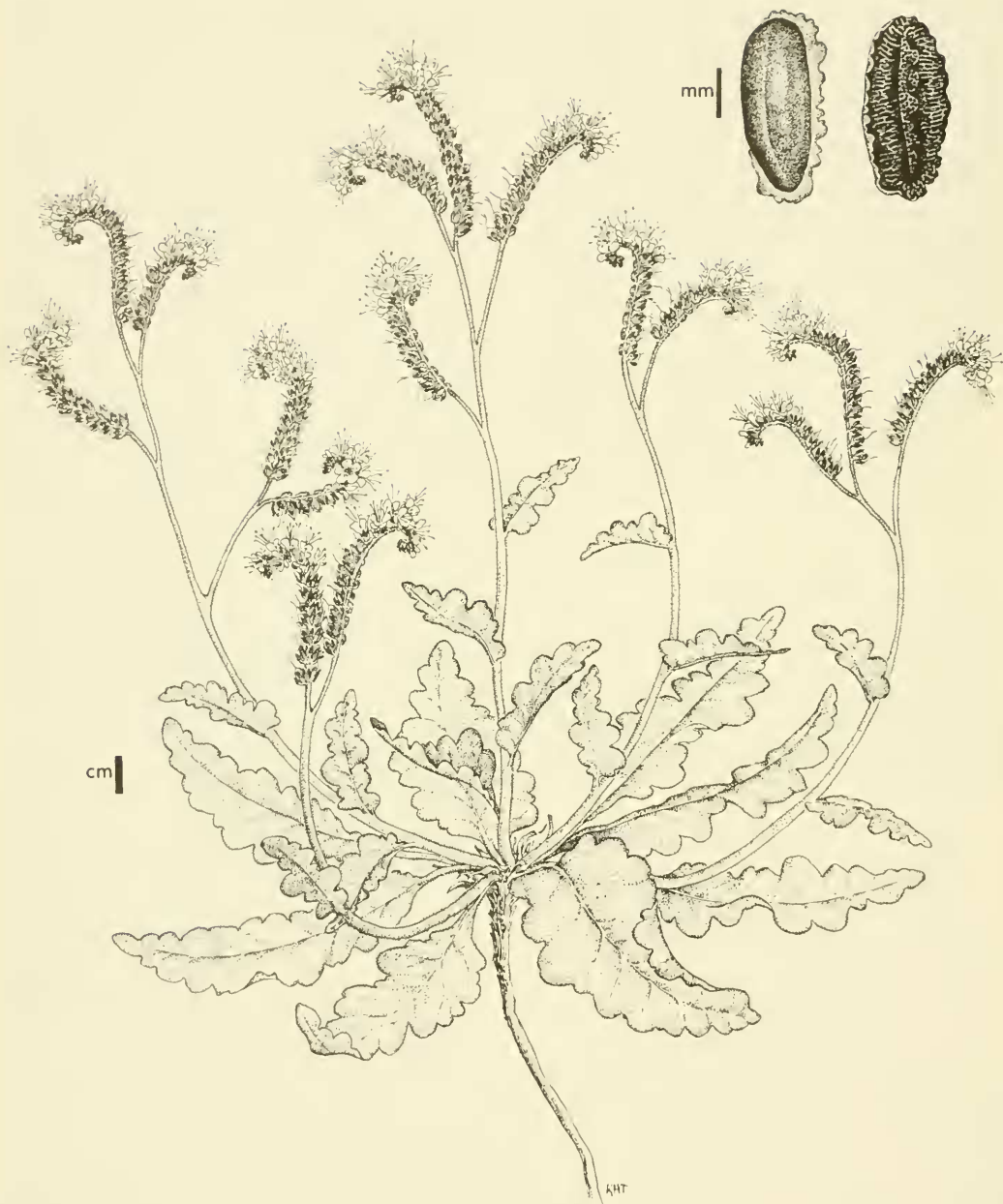


Fig. 21. *Phacelia howelliana* Atwood.

shortly bifid, pubescent; capsule oblong, 3-4 mm long; seeds ca 24-35, elliptic, ca 1 mm long, brown, pitted. Type locality: Tooele County, Utah, Dugway.

Wyoming and Idaho, south to Utah and eastern Nevada. Cinder cones and calcerous gravel of the Upper Sonoran Zone. April to June.

Beaver County: 38 miles W Milford, B. Maguire 20978 (BRY, UTC); Wah Wah Pass 35 miles W Milford, B. Maguire 20969 (UTC). Juab County: Fumarole Butte, Cottam & McMillan 9638 (UT). Millard County: Tunnel Springs, W. Cottam 8521 (UT); Ice Springs Craters 10 miles W Fillmore, W. Cottam and C. McMillan 9575 (UT); Black Rock Volcano west of Kanosh, C. McMillan (UT); 2 miles S Garrison, H. Ripley & R. Barney



Fig. 22. *Phacelia incana* Brand.

3571 (CAS); Warm Point Ridge west end of Pine Valley, B. Maguire 20882 (BRY, UTC). Uintah County: Willow Creek south of Ouray, N. Holmgren & J. Reveal 1897 (BRY, CAS, UTC).

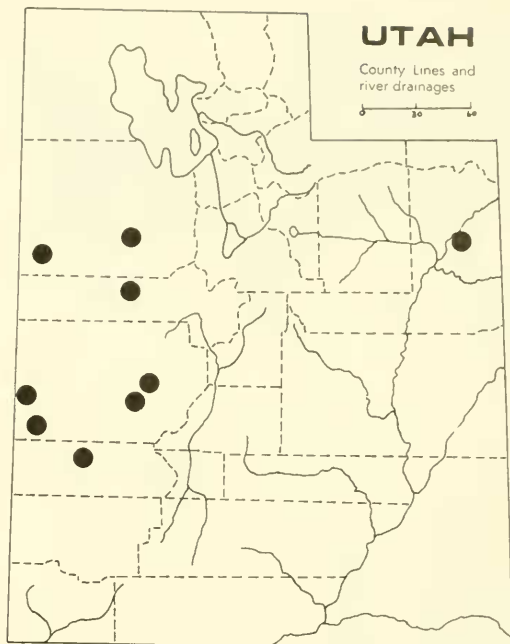
19. *Phacelia indecora* J. T. Howell

Fig. 23; Map. 34

Phacelia indecora J. T. Howell. Amer. Midl. Natur. 29: 12. 1943.

Plants annual, 0.3-1.4 dm high; stems erect to spreading, branched, glandular; leaves elliptic to oblong, .4-2.6 cm long, hirsutulous and glandular; sepals oblanceolate, 3-5 mm long; corolla narrowly campanulate, light blue, 3-4 mm long, the lobes pubescent, the tube pale yellow and streaked with blue lines; capsule elliptic, 3-4 mm long; seeds ca 40. Type locality: San Juan County, Utah, Bluff.

Known only from Wayne and San Juan Counties, Utah. Clay soil. May to June. Endemic, rare, and endangered.



Map 33. Utah distribution of *Phacelia incana* Brand.

San Juan County: Bluff, M. Jones s.n. (CAS); Wayne County: 19 miles W Hanksville, D. Atwood 1363 (BRY, CAS).

20. *Phacelia integrifolia* Torr. var. *integrifolia*

Fig. 24; Map 35

Phacelia integrifolia Torr. var. *integrifolia*. *Phacelia integrifolia* Torr., Ann. Lyc. New York 2: 222, t.3. 1826.

Phacelia arenicola Brandege, Univ. Calif. Pub. Bot. 4: 185. 1911.

Phacelia integrifolia Torr. var. *arenicola* (Bran-dege) Brand, Pflanzenz. IV. 251: 82. 1913.

Plants annual or winter annual, 1.6-6 dm tall; stems erect, puberulent, finely to densely stipitate-glandular and hirsute; leaves simple, crenate to somewhat cleft, oblong to ovate or lanceolate, strigose, finely glandular and setose; inflorescence of compound scorpioid cymes, the cymes elongating to 2.1 cm in fruit, pedicels 1 mm long; sepals oblanceolate to elliptic, 3-4.5 mm long in flower and 4.4-6.5 mm in fruit, 1-1.8 mm wide in flower and up 2.8 mm long in fruit; corolla campanulate, purplish to lavender, 5-6.5 mm long and broad; stamens and style exserted 5-6 mm; style bifid 2/3-3/4 its length, pubescent below; capsule ovoid to globose, 3.2-5.3 mm long, pubescent; mature seeds

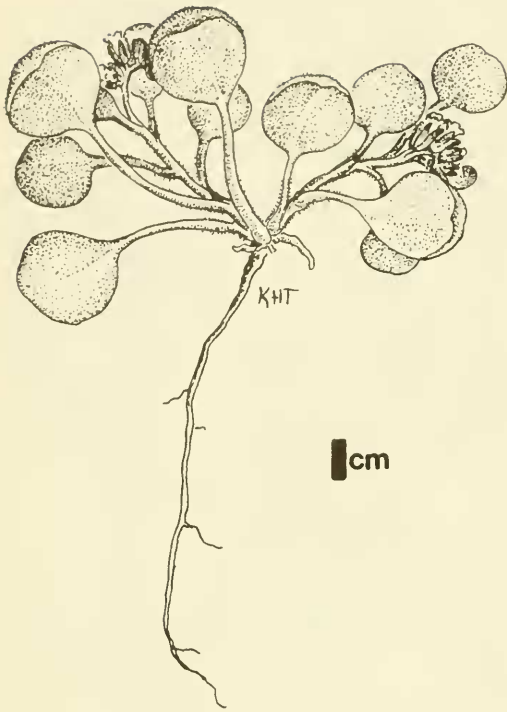


Fig. 23. *Phacelia indecora* J. T. Howell.



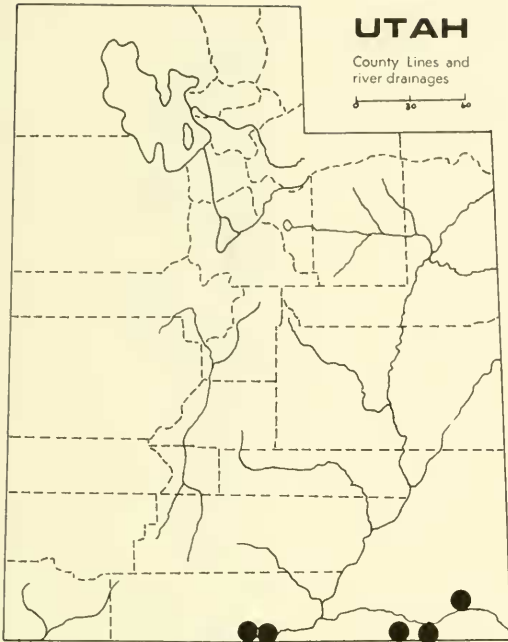
Fig. 24. *Phacelia integrifolia* Torr. var. *integrifolia*.



Map 34. Utah distribution of *Phacelia indecora* J. T. Howell.

4, oblong to elliptic, dark brown to black, 3.1-4.5 mm long, 1.7-2.2 mm wide, transverse ridges on the dorsal surface quite distinct, the ventral surface lacking corrugations, the ridge often curved to one side. Type locality: on the Platte, Dr. James.

Southeastern Utah, south through northeastern Arizona, east through much of New Mexico to western Texas and



Map 35. Utah distribution of *Phacelia integrifolia* Torr. var. *integrifolia*

Chihuahua, Mexico. Sandy to rocky hills and flats of *Larrea*, *Yucca*, *Quercus*, *Coleogyne* and grass communities, 3,750 to 7,500 feet. Late March to mid-September.

Kane County: Glen Canyon City, A. Cronquist 10170 (RM); ca 56 miles E Kanab, A. Cronquist (BRY, NY, RM); 7 miles S Glen Canyon City, Cedar Mountain, D. Atwood 3504 (BRY); Cedar Mountains ca 4 miles S Glen Canyon City, D. Atwood 3610 (BRY). San Juan County: Monument Valley on Utah-Arizona line, J. Howell 24692 (CAS); south of Mexican Hat, D. Atwood 2495 (BRY, CAS, NY, WTSU); The Needle, Monument Valley, A. Holmgren 3233 (NY); along the San Juan River near Bluff, P. Rydberg & A. Garrett 10033 (NY).

21. *Phacelia ivesiana* Torr. in Ives.

Fig. 25; Map 36

Phacelia ivesiana Torr. in Ives' Color. River Expl. Bot. 21. 1860.

Phacelia campestris A. Nels., Bull. Torr. Bot. Club 26: 242. 1899.

Phacelia ivesiana Torr. f. *campestris* (A. Nels.) Brand, Pflanzr. IV. 251: 126. 1913.

Miltitzia pinnatifida Osterhout, Bull. Torr. Bot. Club 53: 35. 1926.

Plants annual, 0.4-2.7 dm tall, hirsutulous and glandular; stems ascending or prostrate; leaves pinnately divided or lobed, oblong to lanceolate, 1-5 cm long;

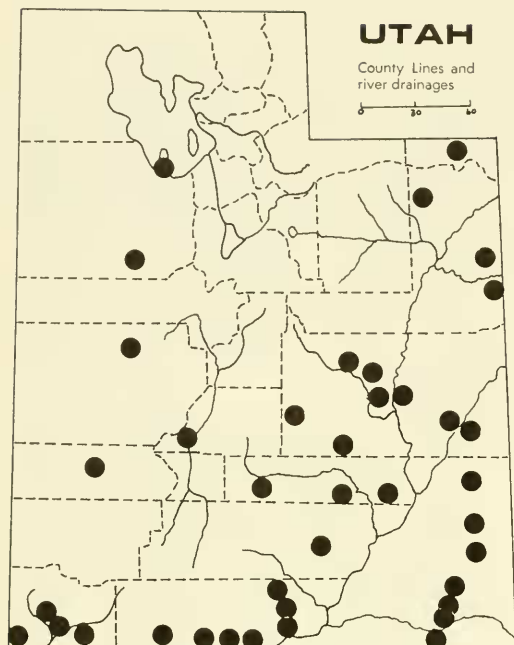
inflorescence of laxly flowered racemes; sepals oblong to oblanceolate, 5-7 mm long, unequal; corolla funnelform, white, the tube yellowish, 2-4 mm long; stamens included, filaments glabrous; style included, divided 1/4 its length, glabrous; capsule oblong, 3-4.5 mm long, hispidulous at the apex; seeds 8-15, brown, 1-1.5 mm long, corrugated transversely. Type locality: Arizona.

Wyoming, south to Arizona, New Mexico and southeastern California. Sandy soil on mountain hillsides and deep sandy desert areas.

Daggett County: Flaming Gorge, L. Williams 475 (UTC). Emery County: 1 mile NW junction 6-50/Huntington-Castledale road, D. Atwood 1282 (BRY); Buckhorn Wash, B. Harrison 8140 (BRY); 3 miles E Greenriver, D. Atwood 1322 (BRY); Tidwell Draw, D. Atwood 1317 (BRY). Garfield County: Eggnog Spring, Bullfrog Creek, S. Welsh 3982 (BRY). Grand County: Arches National Monument, L. Anderson 53 (UTC); 1 mile E Moab Bridge, Deming 1-14 (BRY). Kane County: 2-4 miles W junction at head of Collets



Fig. 25. *Phacelia ivesiana* Torr. in Ives.



Map 36. Utah distribution of *Phacelia ivesiana* Torr. in Ives.

Wash. D. Atwood 1868 (BRY); 48 miles SE Escalante, A. Cronquist 10035 (BRY); .5 mile W Paria River Bridge along US 89, S. Welsh & D. Atwood 9758 (BRY); ca 45 miles E Glen Canyon City on Little Valley Dugway, D. Atwood & R. Allen 2679 (BRY). Juab County: Simpson's Spring, Cottam 7631 (UT). San Juan County: 13 miles N Monticello, A. Cronquist 9007 (UTC); 15 miles S Blanding, A. Holmgren 3137 (UTC); 25 miles S Blanding on highway 163, D. Atwood 2452 (BRY); 2 miles NW Bluff, B. Maguire, 13516 (UTC); ca 21 miles S Mexican Hat, D. Atwood 2490 (BRY). Uintah County: 14 miles N Bonanza, D. Atwood 1546 (BRY); 1 mile W Rainbow, N. Holmgren et al. 1796 (BRY, UTC). Washington County: north of St. George, D. Galway s.n. (BRY); 4 miles W Hurricane, L. Higgins 4217 (BRY); Washington Black Ridge, W. Cottam 4680 (BRY); Diamond Valley, L. Higgins 4201 (BRY); Dixie State Park, L. Higgins 872 (BRY); 20 miles SE Hurricane, A. Cronquist 10093 (BRY); Beaver Dam Mountains, L. Higgins 319 (BRY). Wayne County: southeast of Hauksville, C. Parry s.n. (UTC); Barrier Canyon, Welsh & Atwood 9887 (BRY).

22. *Phacelia linearis* (Pursh) Holz.

Fig. 26; Map 37

Phacelia linearis (Pursh) Holz., Contr. U.S. Natl. Herb. 3: 242. 1895.

Hydrophyllum lineare Pursh, Fl. Am. Sept. 134. 1814.

Eutoca menziesii R. Br., Grandl. Journ. 764. 1823.



Fig. 26. *Phacelia linearis* (Pursh) Holtz.

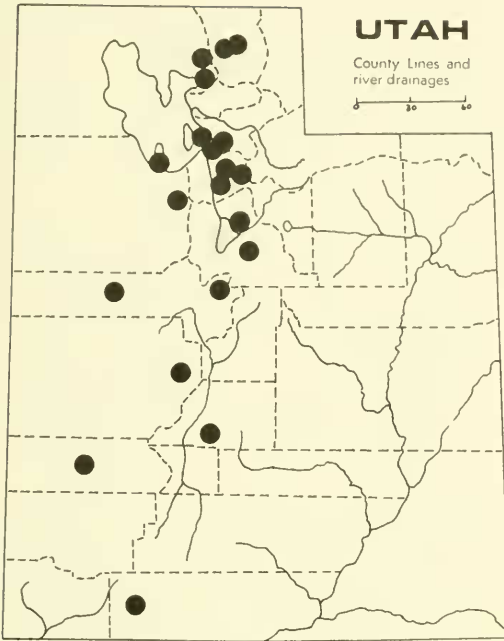
Phacelia menziesii Torr. ex S. Wats., Bot. King Expl. 252. 1871.

Eutoca multiflora Dougl. ex Lindl., Bot. Reg. 14. pl. 1180. 1828.

Eutoca menziesii R. Br. var. *multiflora* A. DC., Prodr. 9: 294. 1845.

Eutoca congesta Dougl. ex Lehmann, Stirp. Pug. 2: 18. 1830.

Eutoca menziesii R. Br. var. *congesta* A. DC., Prodr. 9: 294. 1845.



Map 37. Utah distribution of *Phacelia linearis* (Pursh) Holz.

Plants annual, 1-5 dm tall; stems erect, mostly simple, hirsute and strigulose; leaves linear to lanceolate, 2-7 cm long, entire or pinnately lobed at the base, sessile or nearly so; inflorescence of open panicles, flowers many; sepals linear to oblanceolate, 3-6 mm long; corolla broadly campanulate, bluish purple or white, 6-10 mm long, 8-17 mm wide; stamens included or barely equaling the corolla, filaments hairy; style equaling the corolla, bifid 1/3 its length, pubescent; capsule ovoid to oblong, 5-7 mm long; seeds mostly 6-15, oval to oblong, 1.4-1.6 mm long, dark brown to blackish, pitted. Type locality: "On the banks of the Missouri."

Northern California, east to Utah and Wyoming, north to British Columbia and Alberta, May to July. Usually as understory of shrubs in the foothills.

Beaver County: 11.5 miles E Milford, B. Maguire 20992 (UTC). Box Elder County: south of Honeyville, M. Burke 3099 (UTC); Sink-spring Bench, M. Burke 3097 (UTC); 4 miles S Willard, D. Galway 2184-G (BRY). Cache County: Logan Canyon, S. Flowers 753 (UT); .5 mile up Spring Hollow, B. Maguire 13769 (UTC). Davis County: Bountiful, W. Cottam et al. 16094 (UT); east side of Bountiful City Reservoir, L. Hogan 54 (BRY). Juab County: Granite Canyon, Deep Creek Mountains, B.

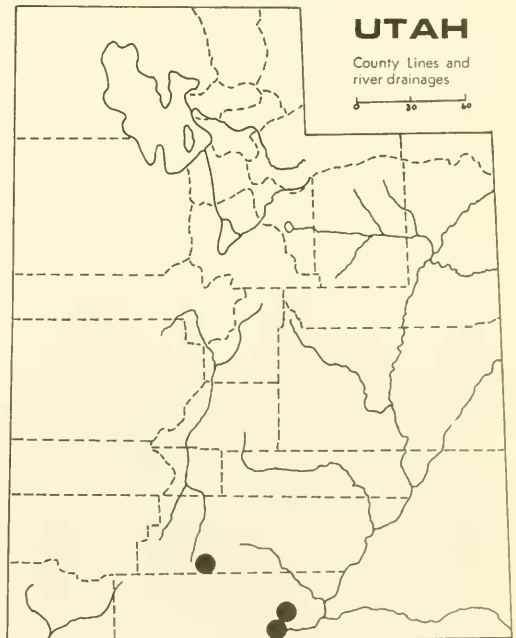
Maguire & R. Becraft 2751 (UTC). Kane County: vicinity of Glendale, F. Wann 35 (UTC). Millard County: 9 miles E Fillmore, G. Worthen 261 (UT). Salt Lake County: Bell Canyon, A. Bleak 59 (UT); near Mueller Park, D. Dunn 1787 (BRY); Sandy, I. Diehl s.n. (BRY); .25 mile S Parley's Canyon, R. Vickery, Jr. 822 (UT); Big Cottonwood Canyon, W. Green s.n. (UT); City Creek Canyon, J. Erskine 14026 (UT). Sevier County: Monroe Canyon, K. Erdman 412 (BRY). Tooele County: south Willow Creek, Stansbury Range, B. Maguire 21799 (BRY, UTC); Mnir Trail, Oquirrh Mountains, W. Cottam, et al. 16862 (BRY). Utah County: Hobbie Creek Canyon, B. Harrison 7002 (BRY); Pleasant View, B. Harrison 8344 (BRY); Y Canyon, H. Chapman 21 (BRY); Thistle, no name s.n. (UT); Springville, B. Dougall s.n. (UT). Weber County: South Ogden Canyon, A. Collotzi 155 (UTC); Strong Canyon, J. Phelps s.n. (Weber); Cold Water Canyon, W. Saxey s.n. (Weber).

23. *Phacelia mammillarensis* Atwood

Fig. 27; Map 38

Phacelia mammillarensis Atwood Phytologia 26 (6): 437. 1973.

Plants annual, 0.9-5 dm tall; stems erect or sometimes branched below, yellowish or green, densely stipitate-glandular; leaves simple, oblong to lanceolate, irregularly crenate to dentate, 1-7 cm



Map 38. Utah distribution of *Phacelia mammillarensis* Atwood.



Fig. 27. *Phacelia mammillarensis* Atwood.

face pitted, excavated and divided by a prominent ridge, one side of the ridge corrugated, margins corrugated.

Kane and Garfield counties, Utah, May to June. Endemic to the Tropic Shale-Straight Cliffs formation. Edaphically restricted; endangered.

Kane County: Tropic Shale formation, ca 6 miles east along road to Warm Creek from Glen Canyon City, S. Welsh & D. Atwood 9809; Kaiparowits Basin, R.42S., T.1E., B. Olsen 43 (BRY); Warm Creek Bench, 5 miles SE Crosby Creek Junction, B. Olsen 34 (BRY); 3 miles E Glen Canyon City, D. Atwood 2628 (BRY); 7 miles E Glen Canyon City, D. Atwood 2632. Garfield County: Tropic Shale formation 1 mile E Henrieville, D. Atwood 1874 (BRY); ca 8 miles E Henrieville along the highway 54, D. Atwood 1878 (BRY).

P. mammillarensis is related to *P. corrugata* Nels., but differs in its larger stature, having sessile leaves (at least above), a light blue or whitish corolla, and by its longer more densely, stipitate-glandular pubescence. The leaves are not at all lobed or pinnate as is typical in many plants of *P. corrugata*.

24. *Phacelia palmeri* Torr. ex S. Wats.

Fig. 28; Map 39

Phacelia palmeri Torr. ex S. Wats., Bot. King Exped. 251. 1871.

Phacelia foetida Goodding, Bot. Gaz. 37: 58. 1904.

Phacelia palmeri Torr. ex S. Wats. var. *foetida* (Goodding) Brand, Pflanzenr. IV. 251: 79. 1913.

Phacelia palmeri Torr. ex S. Wats. var. *typica* Voss, Bull. Torr. Bot. Club 64: 90. 1937.

Phacelia integrifolia Torr. var. *palmeri* (Torr. ex S. Wats.) Gray, Proc. Amer. Acad. 10: 318. 1875.

Robust biennial, 2.9 dm tall; stems stout, usually solitary (sometimes with few to several branches at the base), densely glandular, hirsute and pilose and becoming hispid with age; leaves oblong to lanceolate, irregularly sinuate, crenate, dentate or serrate, 2-13 cm long, 0.5-3 cm wide, lower densely tufted, petiolate and larger than the sessile, gradually reduced cauline leaves, stipitate-glandular and strigose; inflorescence a dense spicate thyrsus, 0.4-4.2 dm long, individual scorpioid cymes up to 14 cm long in fruit, pedicels about 1 mm long in fruit; sepals oblong to spatulate, 4-5 mm long, 1-1.8 mm wide, glandular and hirsute; corolla tubular, pale (whitish, lavender or violet),

long, 0.5-3 cm wide, stipitate-glandular, setose to strigulous, with sessile leaves or nearly so; inflorescence of terminal or lateral compound scorpioid cymes, stipitate-glandular, puberulent, hirsute to hispid; sepals elliptic to oblanceolate, 4-6 mm long, 1-2 mm wide, stipitate-glandular, and hirsute to hispid; corolla tubular to funnellform, the lobes pale blue to white, 5-8 mm long; stamens and style exserted 5-10 mm, the anthers lavender, the style bifid ca 1/2 its length, the lower 1/4 pubescent; capsule subglobose, 4-5 mm long, pubescent; seeds 4, 3 mm long, 1.5 mm wide, brown, pitted dorsally, ventral sur-

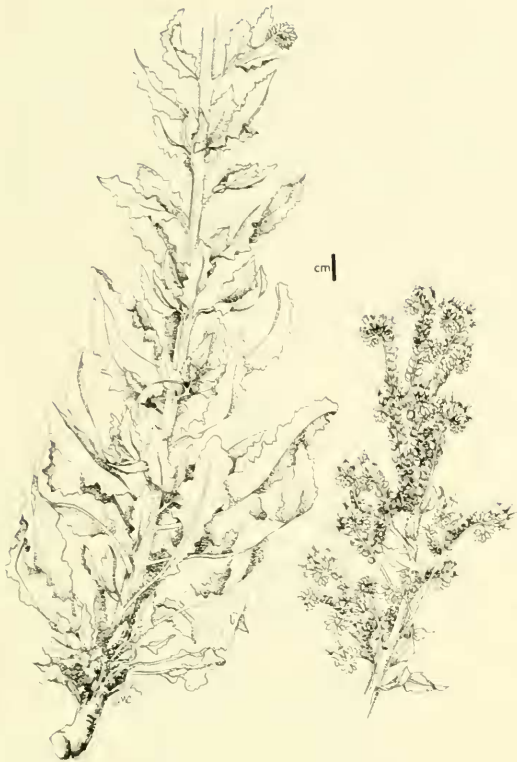
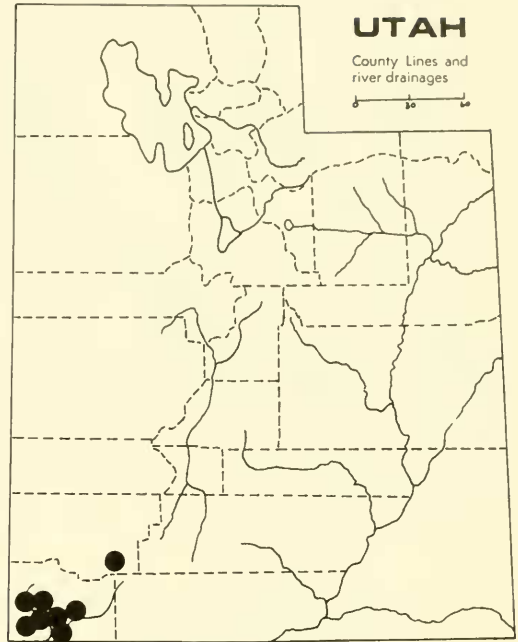


Fig. 28. *Phacelia palmeri* Torr. ex S. Wats.

5-7 mm long, style bifid, the unbranched portion pubescent; capsule globose, 3.2 mm long, glandular to hirsute; mature seeds 4, elliptic, black, 2.5 mm long, 1.5 mm wide, excavated on both sides of the ridge, the ridge corrugated on one side, pitted, margins corrugated, furrows or grooves partly corrugated, dorsal surface longitudinally pitted and transversely ridged. Type locality: Washington County, Utah, southern Utah near St. George on the Rio Virgin.

Clark County, Nevada, east to Washington and Iron counties, Utah and Mohave County, Arizona. Moenkopi formation, late March to August.

Iron County: Cedar Canyon, A. Garrett 6059 (UT). Washington County: 4 miles S Apex Mine, L. Higgins 817 (BRY); ca 10 miles N St. George, D. Atwood 1690 (BRY, CAS, GH, JEPS, NY, POM, RM, UC, US); near Shivits Village, A. Eastwood & J. Howell 9087 (CAS); Dixie State Park, L. Higgins 3441 (BRY, WTSU); SW St. George, D. Atwood 1703 (BRY, US, RM); southern Utah, Bishop s.n. (POM); southern Utah near St. George, Palmer 4 (GH, NY, GH, US); 6 miles E Hurricane, D. Atwood 1404 (BRY, CAS, JEPS); 2 miles E St. George, D. Atwood 1425 (BRY).



Map 39. Utah distribution of *Phacelia palmeri* Torr. ex S. Wats.

25. *Phacelia parishii* A. Gray

Fig. 29; Map 40

Phacelia parishii A. Gray, Proc. Amer. Acad. 19: 88. 1883.

Phacelia salina Jones in Brand, Pflanzenr. IV. 251: 119. 1913.

Plants annual, 0.5-1.5 dm tall; stems diffusely branched, glandular and puberulent; leaves elliptic to oblong, entire to crenate or dentate, 1-3 cm long; inflorescence of densely flowered racemes; sepals oblong to ovate, 3-4.5 mm long, unequal; corolla narrowly campanulate, lavender, the tube yellowish, 5-6 mm long; stamens included, filaments hairy at the base; style included, cleft ca 1/3 its length; capsule oblong to ovate, 4 mm long, hirsutulous; seeds ca 25-43, dark brown to blackish, 1-1.3 mm long, finely pitted. Type locality: California, Rabbit Springs, Mohave Desert.

Commonly on alkaline flats in the deserts of California and Nevada. To be expected in southwestern and western Utah.

26. *Phacelia peirsoniana* J. T. Howell

Fig. 30; Map 41

Phacelia peirsoniana J. T. Howell, Leaflet, West. Bot. 3: 117. 1942.

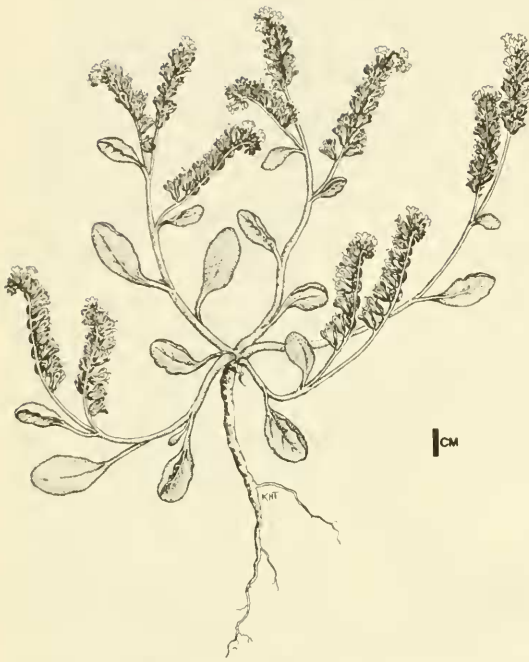
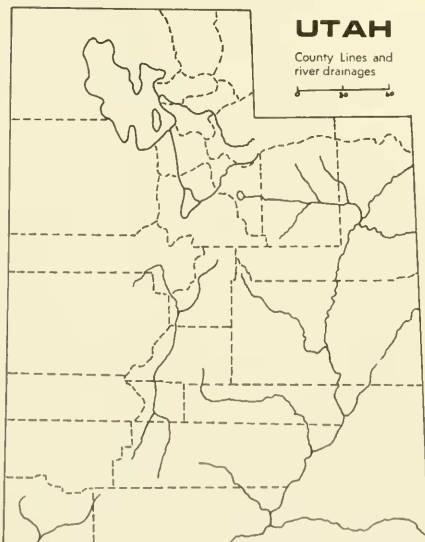


Fig. 29. *Phacelia parishii* A. Gray.



Map 40. Distribution near Utah of *Phacelia parishii* A. Gray.

Plants annual, 1-4 dm tall; stems erect, leafy, branched above, glandular, villous to puberulent; leaves simple, crenate to dentate, 1-5 cm long; cordate to

truncate; inflorescence of laxly flowered racemes; sepals linear to oblong or lanceolate, 3-4 mm long, strongly accrescent and longer in fruit; corolla narrowly campanulate, light blue or white, 5 mm long; stamens and style included, filaments hairy at the base; capsule oblong, 4-6 mm long, brown to blackish, ca 1 mm long. Type locality: Mono County, California, Little Round Valley.

California and Nevada. Calcareous gravel and volcanic areas, May to August. To be expected in southern Utah.

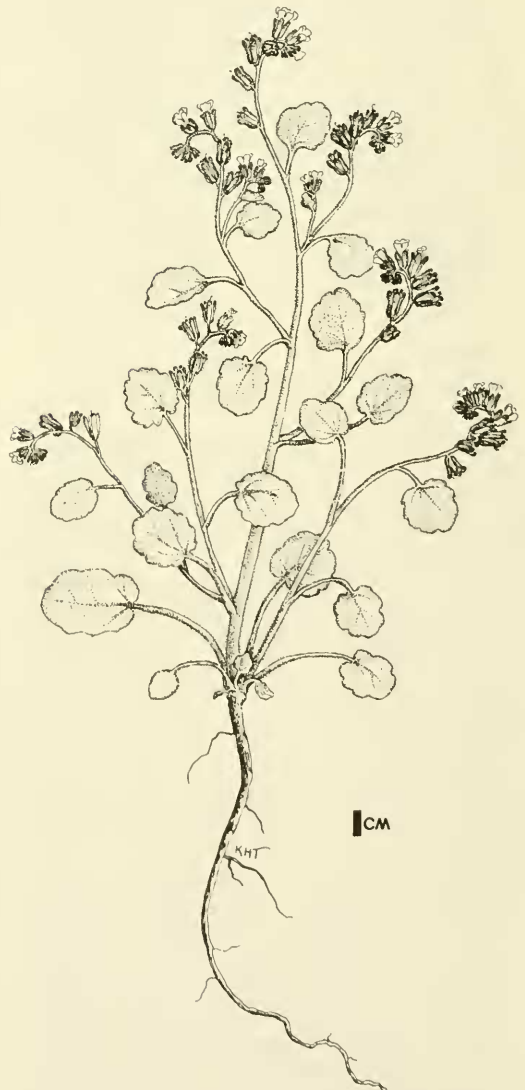
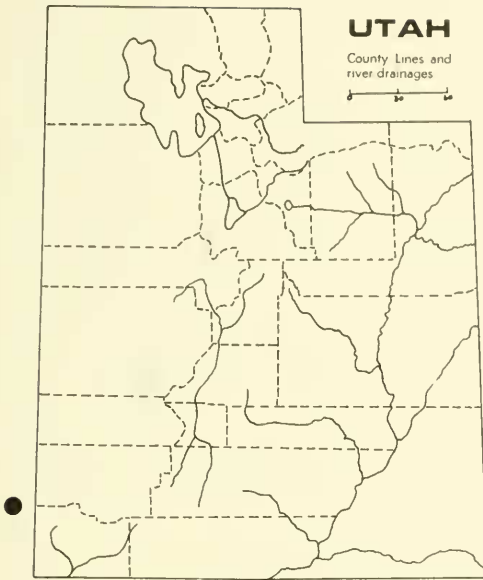


Fig. 30. *Phacelia peirsoniana* J. T. Howell.



Map 41. Distribution near Utah of *Phacelia peirsoniana* J. T. Howell.

27. *Phacelia pulchella* A. Gray

Fig. 31; Map 42

Phacelia pulchella A. Gray, Proc. Amer. Acad. 10: 326. 1875.

Phacelia pulchella f. *luteola* Brand, Pflanzenr. IV. 251: 117. 1913.

Phacelia pulchella f. *rubella* Brand, l.c.

Phacelia gooddingii Brand, Pflanzenr. IV. 251: 120. 1913.

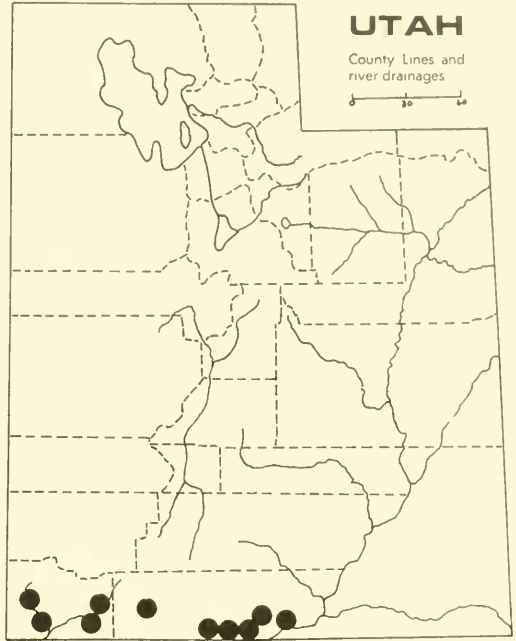
Phacelia pulchella Gray var. *gooddingii* (Brand) Howell, Leaflet West. Bot. 3: 119. 1942.

Phacelia pulchella Gray var. *sabulonum* Howell, Amer. Midl. Natur. 29: 12. 1943.

Plants annual, 0.5-2 dm tall; stems erect or ascending, diffusely branched, leafy,



Fig. 31. *Phacelia pulchella* A. Gray.



Map 42. Utah distribution of *Phacelia pulchella* A. Gray.

finely glandular; leaves oblong to orbicular, entire or toothed to dentate, 1-2.5 cm long; inflorescence of lax, simple to compound scorpioid cymes; sepals oblanceolate, 3-7 mm long; corolla campanulate, purple or violet, 8-14 mm long; stamens included, filaments hairy at the base; style included, bifid at the apex and hairy below; capsule oblong to ovoid, 3-5 mm long, hirsutulous above; seeds 28-50, oblong to elliptic, ca 1 mm long, brown, coarsely pitted. Type locality: Washington County, Utah, St. George.

Moencopia and Chinle formations, and gravelly slopes in the Sonoran Zones. April to June.

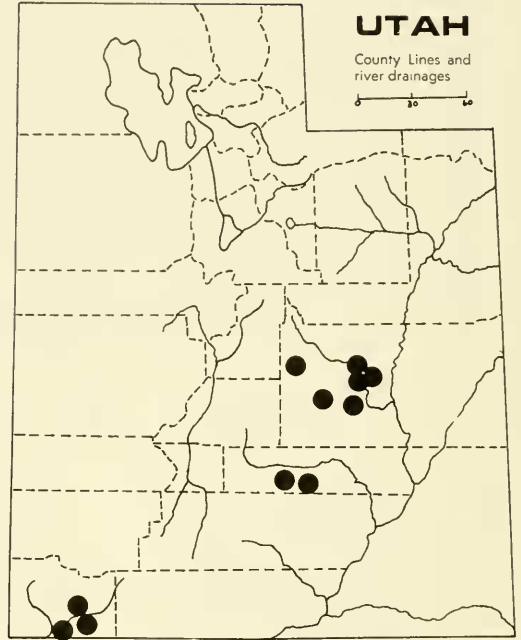
Kane County: 5 miles N Mt. Carmel Junction, B. Maguire et al. 12301 (UTC); 30 miles E Kanab, D. Atwood 1533 (BRY); 47 miles E Kanab, A. Cronquist 10201 (BRY); Nipple Bench, Atwood & Allen 2809 (BRY); ca 4 miles N US 89 on Cottonwood Wash road, D. Atwood & R. Allen 1762A (BRY); ca 43 miles E Glen Canyon City, D. Atwood, S. Welsh & D. Murdock 2720A (BRY). Washington County: Hurricane, F. Wann 1504 (UTC); Cottonwood Creek, R. Fierisch 43 (UTC); Mouth of Zion Canyon, B. Maguire 16341 (UTC); Gunlock, W. Cottam s.n. (UT); St. George, W. Cottam 7250 (UT); 6 miles E Hurricane, D. Atwood 1403 (BRY); Apex Mine, W. Cottam 4717 (BRY); Rockville, B. Harrison 274 (BRY).

28. *Phacelia rafaensis* Atwood

Fig. 32; Map 43

Phacelia rafaensis Atwood, Rhodora 74(800): 451-468. 1972.

Erect biennial herb, 0.8-5.4 dm tall; stems stout, simple or sometimes branched at the base, olive green to brownish, glandular and hirsute; basal leaves petiolate, dentate, crenate to pinnatifid, 2-7 cm long, 0.5-1.5 cm wide, strigose to hirsute, cauline leaves sessile, undulate to crenate or dentate, oblong-lanceolate, 1-10 cm long, 0.5-3.5 cm wide, strigose to hirsute and sparsely stipitate-glandular; inflorescence mainly terminal, paniculate, some axillary, flowers nearly sessile; sepals oblanceolate to spatulate, 3-4 mm long in flower, 5-6 mm long in fruit, 1-1.7 mm wide, glandular and hirsute; corolla

Fig. 32. *Phacelia rafaensis* Atwood.Map 43. Utah distribution of *Phacelia rafaensis* Atwood.

tubular, pale and grooved with the lobes somewhat spreading, 5-6 mm long; stamens and style exerted only 3-5 mm, anthers dull in color, style bifid 3/4 its length, the lower half pubescent; capsule globose, 4-5 mm long, stipitate-glandular and hirsute; mature seeds 4, elliptic to oblong, 3.5-4 mm long, 1.5-2 mm wide, ventral surface alveolate, lighter than the dorsal surface, excavated on both sides of a prominent ridge, the ridge sometimes corrugated along one side, the margins usually entire, dorsal surface brown and less deeply pitted, the surface often smoothish. Type locality: Wayne County, Utah, Capitol Reef National Monument.

South central and southern Utah, south to northern Arizona. Clay hills of the Moenkopi formation, May to June. Restricted and local; possibly threatened.

Emery County: east of Ferron, W. Cottam A5204A (UT); 2 miles S San Rafael River Bridge, San Rafael Swell, D. Atwood 1843 (BRY); Moencopia formation Buckhorn Wash-San Rafael River, S. Welsh, D. Atwood & G. Moore 9819 (BRY). Washington County: 4 miles S Glendale, B. Maguire et al. 4392 (UTC); Virgin Narrows, W. Cottam 1125 (UT); near Virgin, A. Eastwood & J. T. Howell 9200 (CAS); 2 miles E Hurricane, D. Atwood 1409 (BRY).

29. *Phacelia rotundifolia* Torr. ex S. Wats.

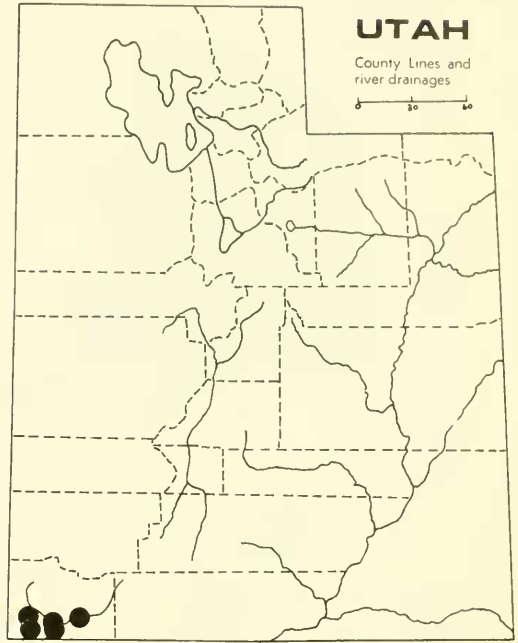
Fig. 33; Map 44

Phacelia rotundifolia Torr. ex S. Wats., Bot. King Expl. 253. 1871.

Plants annual, 0.3-3 dm tall; stems erect, hirsute and glandular; leaves rotund, coarsely toothed, 0.4-2.1 cm long and broad, petioles up to 4 cm long; inflorescence of loosely flowered racemes, these elongate in fruit; sepals linear to oblanceolate, 3-6 mm long, ca 1 mm broad, hirsute and glandular; corolla tubular, pale blue, lavender or white, 4-5 mm long, the tube yellow; stamens included, filaments glabrous; style included, bifid; capsule oblong, ca 4 mm long, finely pubescent; seeds over 60, less than 1 mm long, brown, pitted. Type locality: Utah: Palmer in 1870.

California, east to Utah and Arizona. Gravelly, lava, or sandy soil of hillsides and mountain slopes. March to June.

Kane County: 3.7 miles E Skutumpah-Alton Junction at head of Johnston Wash, D. At-



Map 44. Utah distribution of *Phacelia rotundifolia* Torr. ex S. Wats.

wood 1803 (BRY). Washington County: west of St. George, D. Galway s.n. (BRY); 3 miles W Shivwits Res., L. Higgins s.n. (BRY); Virgin Narrows, W. Cottam 7284 (UT); south of Virgin River, St. George, D. Beck s.n. (BRY).

30. *Phacelia salina* (A. Nels.)

J. T. Howell

Fig. 34; Map 45

Phacelia salina (A. Nels.) J. T. Howell, Leaflet West. Bot. 4: 16. 1944.

Emmenanthe foliosa M. Jones, Zoe 4: 278. 1893.
Emmenanthe salina A. Nels., Bull. Torr. Bot. Club 25: 381. 1898.

Miltitzia foliosa (Jones) Brand, Pflanzenr. IV. 251: 131. 1913.

Plants annual, from a slender taproot; stems several, hirsutulous and finely glandular, these capitate; leaves elliptic to oblanceolate, 0.5-1.7 cm long, entire to pinnately lobed; inflorescence of laxly flowered cymes; sepals linear to oblanceolate, 3-6 mm long, hirsutulous; corolla tubular, lavender tinged, yellow, 3-4 mm long; stamens and style included, filaments glabrous, style hairy below; capsule elliptical to ovate, 3-4 mm long; seeds 7-9, 1-2 mm long, oblong, corrugated. Type locality: Tooele County, Utah, Deep Creek Valley above Furber.



Fig. 33. *Phacelia rotundifolia* Torr. ex S. Wats.

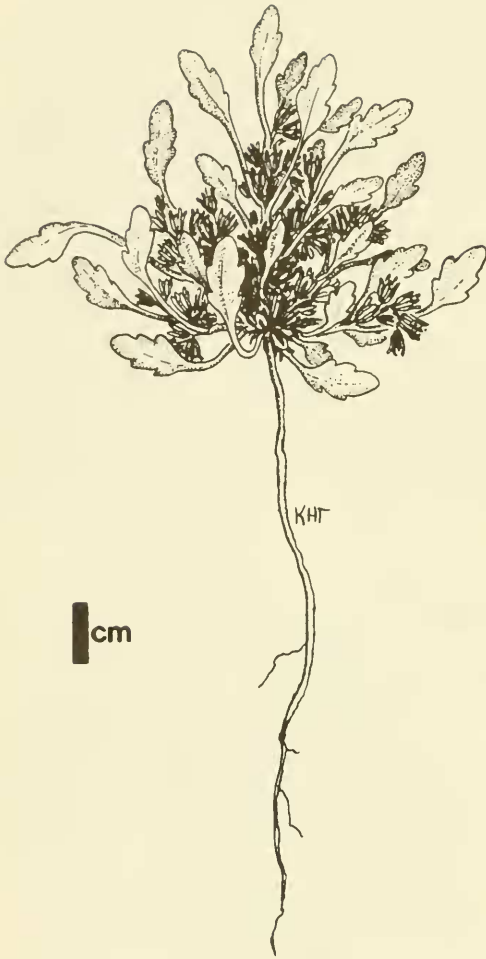


Fig. 34. *Phacelia salina* (A. Nels.) J. T. Howell.

Southern Wyoming, south to Utah and Nevada. Alkaline soil of desert areas. May to June. Rare and possibly extinct.

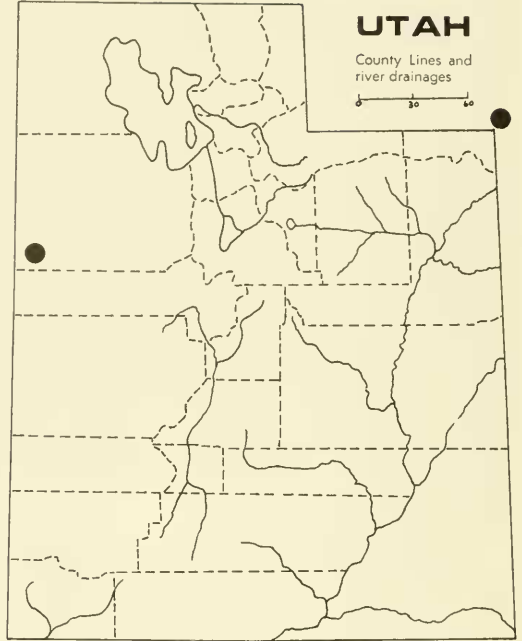
Known from Utah only by the type collection near Furber, Tooele County.

31. *Phacelia saxicola* A. Gray

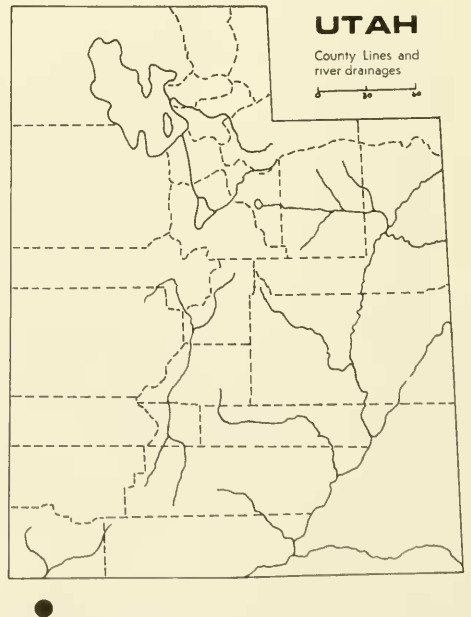
Fig. 35; Map 46

Phacelia saxicola A. Gray, Proc. Amer. Acad. 20: 169. 1884.

Plants annual, 0.5-1.5 dm tall; stems erect to ascending, glandular and hispid; leaves oblanceolate or broader, 5-7 mm long, entire; inflorescence of laxly branched cymes; sepals linear to oblanceolate, 3-7 mm long; corolla narrowly campanulate, light blue, the tube white 3-4 mm long; stamens included, filaments glabrous; style included, bifid; capsule

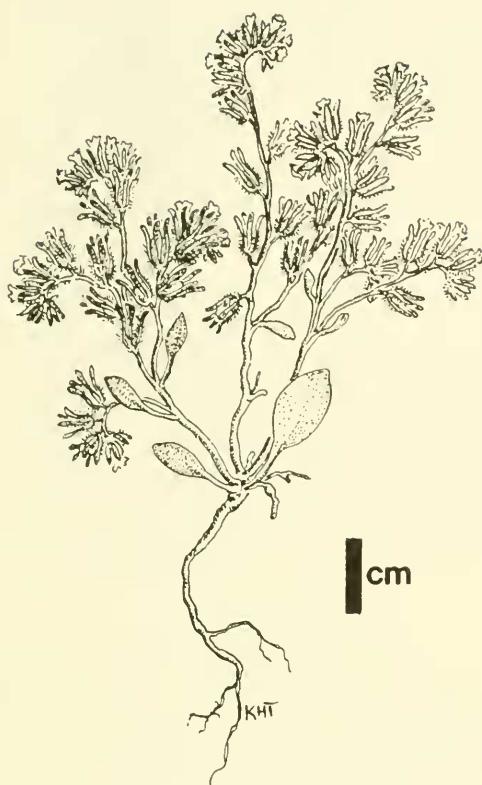


Map 45. Utah distribution of *Phacelia salina* (A. Nels.) J. T. Howell.



Map 46. Distribution near Utah of *Phacelia saxicola* A. Gray.

ovoid, ca 3 mm long; seeds 40-55, oval, flattish, black, pitted to smooth, ca 0.5 mm long. Type locality: Arizona: Kingman Station.

Fig. 35. *Phacelia saxicola* A. Gray.

Eastern California, east through southern Nevada to northern Arizona. Commonly on limestone soils, April to July. To be expected in southwestern Utah.

32. *Phacelia scopulina* (A. Nels.)

J. T. Howell

Fig. 36; Map 47

Phacelia scopulina (A. Nels.) J. T. Howell, Leaflet. West. Bot. 4: 16. 1944.

Emmenanthe scopulina A. Nels., Bull. Torr. Bot. Club 25: 380. 1898.

Miltitzia lutea (H & A.) A. DC. var. *scopulina* (Nels.) Brand, Pflanzenr. IV. 251: 131. 1913.

Miltitzia scopulina (Nels.) Rydb., Bull. Torr. Bot. Club 40: 479. 1913.

Plants annual, 0.2-1 dm tall; stems 1-several, hirsutulous; leaves oblong to obovate or oblanceolate, entire, crenate to pinnately lobed, 1-3 cm long; inflorescence of densely flowered, compact cymes, these hispid and glandular; sepals linear to oblong or oblanceolate, 3-7 mm long; corolla narrowly campanulate, yellow, 3-5 mm long; stamens and style included;

Fig. 36. *Phacelia scopulina* (A. Nels.) J. T. Howell.

capsule oblong, pubescent, 4-6 mm long; seeds oblong, brown, 1-2 mm long, corrugated. Type locality: Sweetwater County, Wyoming, Green River.

Montana and Wyoming, south to western Utah and northern Nevada, west to Oregon. Desert slopes in sandy to gravelly soil. May to June.

Known only from Tooele County, in Utah.

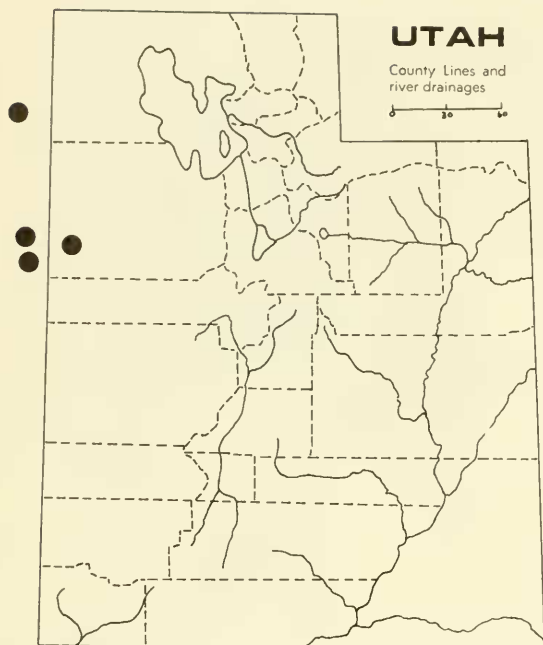
33. *Phacelia sericea* (Graham) A. Gray

Fig. 37; Map 48

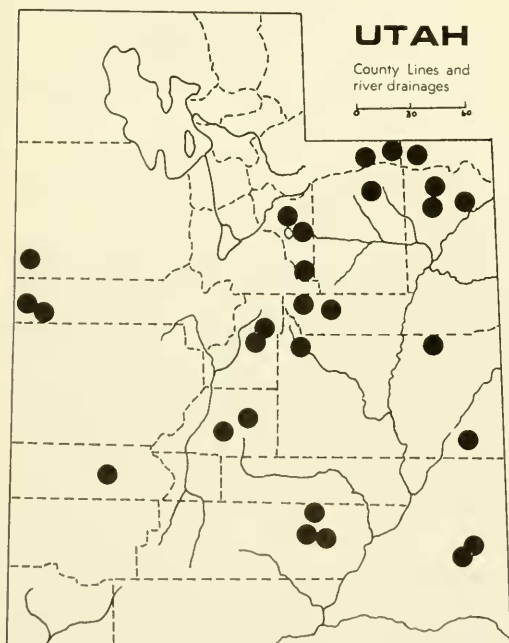
Phacelia sericea (Graham) A. Gray, Amer. Journ. Sci. II, 34: 254. 1862.

Eutoca sericea Graham, Bot. Mag. 56. 1829.

Plants perennial, 1-5 dm tall; stems stout, erect, simple, with appressed silky pubescence; leaves pinnate to pinnately lobed, oblong in outline, subglabrate; in-



Map 47. Utah distribution of *Phacelia scopulina* (A. Nels.) J. T. Howell.



Map 48. Utah distribution of *Phacelia sericea* (Graham) A. Gray.

florescence a thyrsoid panicle of short cymes; sepals linear to oblong, 3-7 mm long; corolla urceolate to campanulate, 5-8



Fig. 37. *Phacelia sericea* (Graham) A. Gray.

mm long, dark purple, persistent; stamens long exserted, filaments hairy at the base; style exserted, bifid ca 1/2 its length; capsule ovoid, 4-6.5 mm long, pubescent; seeds 20-30, oblong, 1-2 mm long, brown to black, reticulate. Type locality: Rocky Mountains.

Washington and Oregon, south to northern California, east to Utah and Colorado, north to Alberta. June to September.

Beaver County: Beaver Creek, W. Cottam 3515 (UT). Carbon County: Emma Park, R. Hardy s.n. (UT); Schofield Reservoir, T. Jensen 582 (UTC). Daggett County: Hickerson Park, E. Jensen s.n. (UTC); Hoop Lake, A. Holmgren & S. Tilbt 9499 (UTC). Duchesne County: Moon Lake, W. Cottam 9031 (UT); head of Blind Stream, Uintah Mountains, B. Harrison & A. Nisson 8838 (UTC).

Emery County: Huntington Canyon, A. Garrett 7037 (UT). Garfield County: Henry Mountains, B. Maguire 19351 (UTC); Crescent Creek, B. Harrison et al. 7478 (UTC); east side of Henry Mountains, W. Stanton s.n. (BRY). Grand County: Mt. Tomasky, B. Maguire et al. 16346 (UTC); Hill Creek, N. Holmgren et al. 2317 (UTC). Juab County: Deep Creek Mountains, W. Cottam 3183 (UT). San Juan County: Abajo Peak, B. Maguire & J. Redd 2046 (UTC); North Vega Creek, B. Maguire & J. Redd 2049 (UTC). Sanpete County: South Fork Manti Canyon, N. Holmgren 235 (UTC), Ephraim Canyon, A. Plummer 201 (UT). Sevier County: Fish Lake National Forest, B. Markham s.n. (BRY); Monroe Canyon, W. Cottam 9424 (UT); Fish Lake, W. Cottam 4523 (UT); Deep Creek Mountains, D. Lindsay 264 (UT). Summit County: Dollar Lake at base of Gilbert Peak, D. Hobson & R. Magi 14521 (UTC). Tooele County: Ibapah, W. Cottam 3183 (UT). Uintah County: Kabel Springs, D. Atwood 1612 (BRY); north slope Uintah Mountains, B. Maguire et al. 12405 (UTC). Wasatch County: Strawberry Valley, Smith & Gessel s.n. (UTC); 2 miles E Soldier Summit, B. Maguire 18398 (UTC).

34. *Phacelia splendens* Eastw.

Fig. 38; Map 49

Phacelia splendens Eastwood, Zoe 4: 9. 1893.
Phacelia glandulosa Nutt. subsp. *splendens* (Eastw.) Brand, Pflanzenr. IV. 251: 83. 1913.

Plants annual, 0.5-2.7 dm tall; stems erect, simple or branched, leafy, puberu-

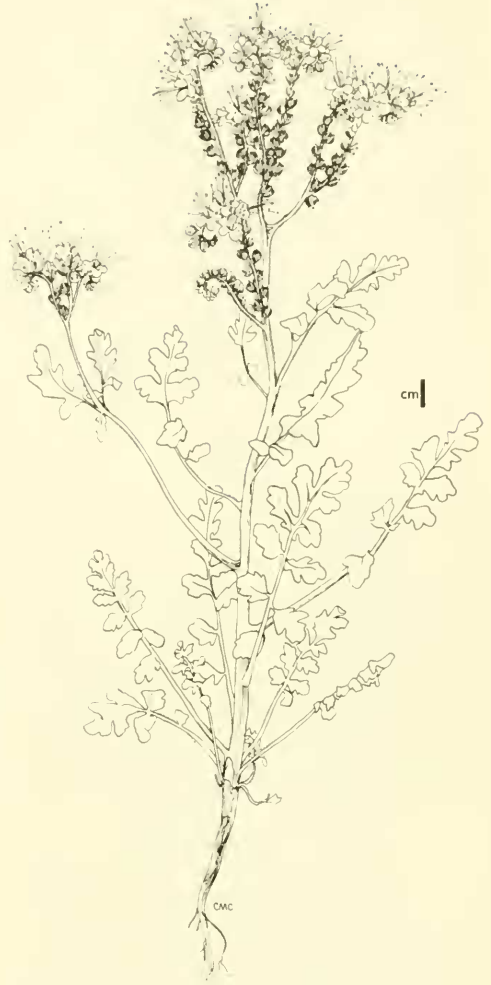
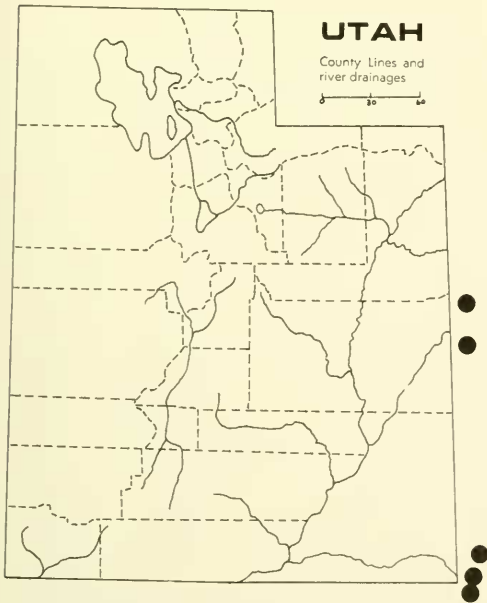


Fig. 38. *Phacelia splendens* Eastwood.



Map. 49. Distribution near Utah of *Phacelia splendens* Eastwood.

lent and with scattered stipitate-glandular hairs; leaves pinnatifid, 2-7.5 cm long, 0.7-4 cm wide, petiolate, leaf blade essentially glabrous (pubescent only on the petiole and rachis or lower portion of the pinnae); inflorescence terminal on each branch and the main stem, cymes compact and densely flowered, pedicels short but lengthening to as much as 1.7 mm in fruit, slightly more pubescent than the stem; sepals linear to narrowly oblanceolate, 2.5-3 mm long in flower, 4-4.4 mm long in fruit, 0.6-1 mm wide, hirsute and with a few scattered glandular hairs; corolla 4-8 mm long and broad, glabrous to sparsely pubescent; stamens and style exerted 7-11 mm, the filaments blue, anthers yellow, style bifid ca 2/3 its

length, the undivided portions puberulent, and glandular; capsule subglobose, 4-4.5 mm long, 3-3.5 mm long, 1.5 mm wide, finely favose, the ventral surface excavated on both sides of the ridge, the ridge with evident corrugations on one side, the margins more or less revolute. Type locality: Mesa County, Colorado, Grand Junction.

Known only from western and south-western Colorado and northern New Mexico. Apparently confined to the Mancos Shale formation, 4,500 to 6,000 feet elevation, mid-May to mid-July.

To be expected in eastern Utah.

35. *Phacelia utahensis* Voss

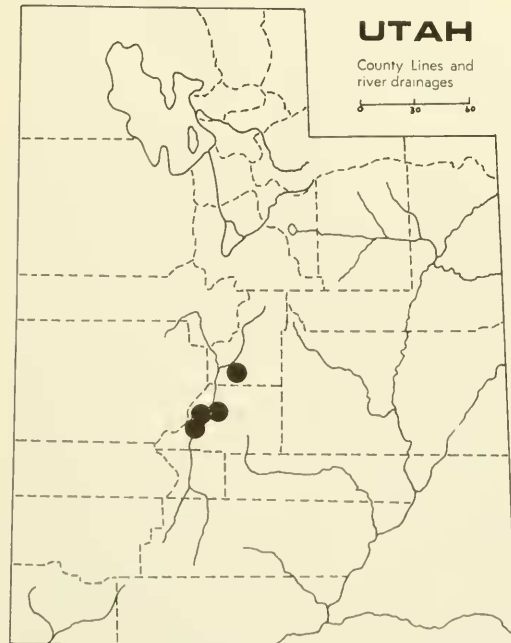
Fig. 39; Map 50

Phacelia utahensis Voss, Bull. Torr. Bot. Club 64: 135. 1937.

Plants stout, erect annuals, 0.8-5.8 dm tall; stems usually simple, sometimes branched at the base, brownish to yellowish, densely glandular and finely pubescent; leaves linear to narrowly lanceolate, strigose to ciliate on the margins and with scattered glands (especially the upper), 1.5-12 cm long, 0.5-1.5 cm wide, the margins often revolute, crenate, undulate to



Fig. 39. *Phacelia utahensis* Voss.



Map 50. Utah distribution of *Phacelia utahensis* Voss.

irregularly dentate, basal ones petiolate and dense, the upper sessile, auriculate to cordate; inflorescence thyrseoid, up to 3.4 dm long, often with a few lateral, leafy inflorescence branches below, stipitate-glandular and finely pubescent, cymes mostly in pairs, (or 1-3), up to 4 dm long in fruit, densely flowered, the pedicels 1-1.5 mm long; sepals oblanceolate, 3-4 mm long, 0.8-1.1 mm wide, glandular and hirsute; corolla rotate to campanulate, the lobes bluish to violet, the tube yellowish, ca 3-4 mm long, ca 6 mm broad, glabrous; stamens exserted 9-10 mm, filaments violet, anthers yellow; style exserted ca 10 mm, bifid 3/4 its length, the lower 1/4 setose and glandular; capsule globose to subglobose, 3.5-4.1 mm long, 2.6-3.5 mm wide, glandular and setose; mature seeds 4, elliptical, dark (reddish), the dorsal surface faintly pitted, the ventral surface excavated on both sides of the ridge, often lighter than

the dorsal surface, pitted with the markings in the excavations longer (transversely) than those of the ridge or margins, the ridge sometimes faintly corrugated on one side. Type locality: Sanpete County, Utah, Gunnison.

Endemic to the Arapian Shale formation in Sevier and Sanpete counties, Utah; threatened. April to June, 5,500 to 5,700 feet.

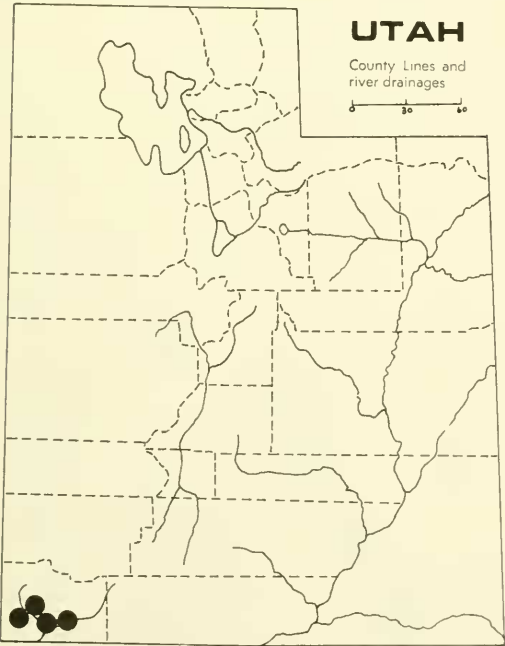
Sanpete County: clay hills west of Mayfield, D. Atwood 1520 (BRY); ca 3 miles W Mayfield, T. Jensen 529 (UTC). Sevier County: near Glenwood, L. Ward s.n. (GH, US); southeast of Sigurd, H. Ripley & R. Barneby 4774 (UTC); 6 miles NW Richfield, D. Atwood 1893 (BRY); 3 miles SE Sigurd, D. Atwood 1835 (BRY); 10 miles NW Richfield, D. Atwood 1895 (BRY); 3 miles S Vermillion, J. Howell & G. True 44640 (BRY).

36. *Phacelia vallis-mortae* Voss

Fig. 40; Map 51

Phacelia vallis-mortae Voss, Bull. So. Calif. Acad. Sci. 33: 175. 1935.

Plants annual, 2-5 dm tall; stems diffusely branched, weak, hispid and glandular; leaves pinnately divided, oblong, hispid, 3-6 cm long; inflorescence of few to numerous, simple cymes, hispid and glandular; sepals linear to oblanceolate,



Map 51. Utah distribution of *Phacelia vallis-mortae* Voss.

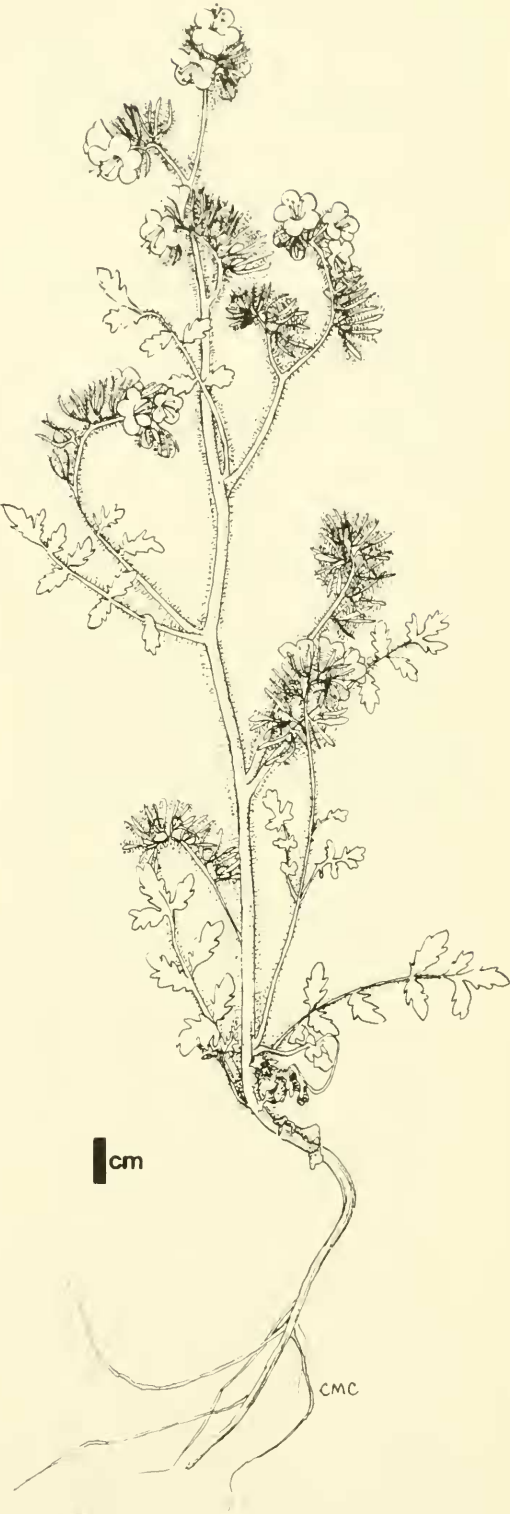


Fig. 40. *Phacelia vallis-mortae* Voss.

3.5-6 mm long, ca 1 mm wide, heavily hispid; corolla broadly campanulate, lavender, 6-10 mm long, 8-10 mm broad; stamens included or nearly so, filaments glabrous; style equaling the corolla, bifid to the middle; capsule globose, 3-4 mm long; seeds mostly 4, ovoid, 2.5-3 mm long, brown, pitted. Type locality: California, Keene's Spring, Death Valley.

Southwestern Utah, south to Arizona and southeastern California. Lower Sonoran Zone, commonly growing as understory. April to June.

Washington County: Castlecliffs, L. Higgins 4167 (BRY); ca 10 miles N St. George, D. Atwood 1692 (BRY); mesa east of Hurricane, F. Wann 1502 (UTC); Beaver Dam's, D. Atwood 1435 (BRY).

9. *Tricardia* Torr. ex S. Wats.

Tricardia Torr. ex S. Wats., Bot. King Expl. 258. 1871.

Perennial plants from a thick base; leaves entire, mostly in a basal rosette, long petioled; inflorescence in short racemes, corolla light purple to white, broadly campanulate, with 10 narrow appendages near base of stamens; sepals unequal, becoming scarious-reticulate in

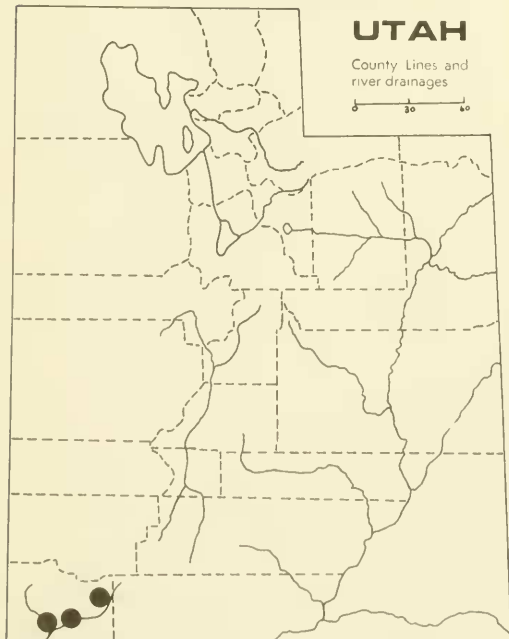
fruit; stamens included, unequal in length, style included, bifid; capsule unilocular and scarious when mature; seeds dark brown, finely alveolate, 4-8.

1. *Tricardia watsonii* Torr. ex S. Wats.

Fig. 41; Map 52

Tricardia watsonii Torr. ex S. Wats., Bot. King Expl. 258. pl. 24. 1871.

Plants perennial; leaves mostly basal, petiolate, entire, sessile; inflorescence of terminal cymes; sepals very unequal, the two inner narrow, the 3 outer cordate, scarious in fruit; corolla broadly campanulate, purplish; stamens included, un-



Map 52. Utah distribution of *Tricardia watsonii* Torr. ex S. Wats.



Fig. 41. *Tricardia watsonii* Torr. ex S. Wats.

equal; style included, bifid; capsule oblong, unilocular; seeds 4-8, brown, finely pitted, oblong. Type locality: Nevada, Truckee Pass.

Washington County: mesa W Hurricane, F. Wann. 1520 (UTC); N St. George, D. Galway s.n. (BRY); Black hill W St. George, D. Hall s.n. (BRY); La Verkin ridge, W. Cottam 5637 (UT).

ACKNOWLEDGMENTS

The author would like to extend his appreciation to Dr. Stanley L. Welsh for his encouragement throughout the duration of this work. To Dr. Larry C. Higgins for his numerous collections of *Phacelia* and association on several collecting trips. Appreciation is also extended to Kay Thorne and Carolyn Christensen for the illustrations. Financial assistance was provided in part by Cost of Education Funds through an NDEA Fellowship, partly by the Department of Botany and Range Science, Brigham Young University and the Bureau of Land Management, Salt Lake City, Utah. The author is indebted to the following herbaria for making available their facilities and assistance: University of Utah (UT), Utah State University (UTC), and Brigham Young University (BRY).

GLOSSARY

Accrescent. Enlarged in fruit.
Alveolate. Honeycombed; pits in the surface of the seeds.
Auricles. Earlike appendages.
Auriculate. With earlike appendages.
Ciliate. Fringed with short hairs.
Corrugated. Wrinkled or folded.
Cymbiform. Boat shaped.
Cyme. A determinate flower cluster in which the first flower is terminal on the main axis and the central flowers open first.
Denticulate. Slightly and finely toothed.
Dimorphic. Having two forms or sizes.
Erose. Irregularly indented.
Favose. Honeycombed; pits in the surface of the seeds.
Filiform. Threadlike.
Fimbriate. Fringed with elongate, slender processes or lobes on the margins of the corolla lobes.
Geminate. In pairs, as regarding the seeds.

Glandular. A globose-secreting structure borne on the surface and estipitate.
Glutinous. Sticky.
Gypsiferous. Containing gypsum.
Hirsute. Pubescence with stiff, coarse hairs.
Hispid. Pubescent with long, very stiff hairs, these able to penetrate the skin.
Hispidulous. Somewhat hispid.
Marcescent. Persistent after withering.
Mauve. Purplish pink.
Pendulous. Hanging, drooping.
Pilose. Pubescent with soft, slender hairs pointed the same direction as if combed.
Pitted. Having little depressions or pits.
Puberulent. Pubescent with very short hairs, not stiff.
Reflexed. More or less bent downward.
Reticulate. Net-veined.
Retorse. Turned downward.
Revolute. Rolled downward from both margins, toward the inside.
Scabrous. Rough to the touch owing to the presence of short stiff hairs.
Scarious. Thin, dry, and membranaceous, not green.
Scorpioid. A unilateral inflorescence circinate-coiled in bud and anthesis.
Setose. Pubescent with short rather stiff hairs, these not able to penetrate the skin.
Stipitate-glandular. A globose, stipitate, secretory structure borne on the surface of vegetative parts.
Strigose. Pubescent with short, straight appressed hairs.
Terete. Cylindric, not angled.
Thyrse. A contracted panicle.
Tuberculate. Having small knoblike projections.
Undulate. With a wavy margin.
Villous. Pubescent with long and weak, tangled but not matted hairs.

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SECOND OCCURRENCE OF THE LONG-NOSED SNAKE, *RHINOCHAILUS LECONTEI LECONTEI*, IN IDAHO

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ABSTRACT.— A second record of the long-nosed snake in Idaho was taken at the entrance to Bruneau Dunes State Park, Owyhee County.

The presence of the Long-nosed Snake, *Rhinocheilus lecontei lecontei*, in Idaho has been based on a single specimen from Glenns Ferry, Elmore County (Klauber 1941). Medica (1975) considered this, and a similar occurrence in Carbon County, Utah, as being representative of disjunct populations.

On 5 May 1972, I found an adult female *R. l. lecontei* that had been recently killed on a road immediately inside the entrance to Bruneau Dunes State Park, Owyhee County. This locality is 37 km (23 mi) west of the Glenns Ferry occurrence. The snake, which was apparently about to shed, had a total length of 656

mm and a snout-vent length of 581 mm. A portion of skin from the mid-body was kept for preservation. When found, the snake had probably not been dead very long, hence weather conditions at the time (1945 hrs) were probably a good approximation to those which existed at the time of the snake's death: air temperature 24 C, light breeze, 5/10 cloud cover.

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NEW RECORDS AND SPECIES OF TETRANYCHIDAE AND TENUIPALPIDAE (ACARINA) FROM UTAH AND IDAHO

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ABSTRACT.— Twenty-three species of spider mites (Tetranychidae) are recognized for Utah and Idaho; three of these are described as new: *Bryobia neoribis*, *Pseudobryobia knowltoni*, and *Schizotetranychus agropyron*. Eleven species of Tenuipalpidae are recorded.

Spider mites and false spider mites are relatively well known in only a few regions of the United States such as Arizona and California where economic and native plants have been carefully surveyed. Therefore, it was believed opportune to publish the following records of tetranychoid mites from Utah and Idaho. These records were compiled from numerous collections made by George F. Knowlton, Professor Emeritus of Entomology at Utah State University, 1972-1975. Information on species other than these was taken from Pritchard and Baker (1955 and 1958) and Knowlton and Ma (1950).

A total of 24 species of Tetranychidae were determined; *Bryobia neoribis*, *Pseudobryobia knowltoni*, and *Schizotetranychus agropyron* are described as new. Eleven species of Tenuipalpidae were recorded.

TETRANYCHIDAE Donnadieu, 1875

Bryobia praetiosa Koch

Bryobia praetiosa Koch, 1836:8; Pritchard and Baker, 1955:26; Wainstein, 1960:102; Tuttle and Baker, 1968:6.

The clover mite (*B. praetiosa*) is one of the most common species and occurred as follows: *Aesculus hippocastanum* L. (horse chesnut) *ex* duff, Logan, Utah, 15 Apr 1973 and 2 May 1974; *Agropyron desertorum* (Fisch.) Schult. (crested wheatgrass), Duck Creek Camp (Kane Co.), Utah, 5 May 1973 and Holbrook, Idaho, 19 Oct 1972; *Agropyron smithii* Rydb. (western wheatgrass), Reese Valley (Chicken Creek Canyon), Utah (7,500 ft.), 19 May 1972; *Artemisia nova* A. Nels., Logan Canyon, Utah, 2 Jul 1973; *Artemisia tridentata* Nutt. (big sagebrush) *ex* duff, Logan, Utah, 14 Nov 1972; *Chrysanthemum* sp., Logan, Utah,

24 Oct 1973; *Chrysothamnus nauseosus* (Pall.) Britton (rabbitbrush), Logan Canyon, Utah, 5 Jun 1973 and Paradise, Utah, 6 Jun 1973; *Chrysothamnus* sp. *ex* duff, Snowville, Utah, 15 Nov 1972 and North Logan, Utah, 14 Nov 1972; grasses (not determined), 10 collections (some include duff) from Idaho and Utah, Feb-May 1973; *Juniperus* sp. *ex* duff, Black Pine Mt. (Curlew Valley), Idaho, 3 May 1974 and Juniper, Idaho, 15 Nov 1972; moss, Blacksmith Fork Canyon, Utah, 30 Apr and 2 May 1973; *Ribes inerme* Rydb. (gooseberry), Tony Grove Canyon (Cache Co.), Utah, 30 Jul 1974; and *Sarcobatus vermiculatus* Torr. (greasewood) *ex* detritus, Wildcat Hills (Box Elder Co.), Utah, 18 Apr 1974. It was reported by Knowlton and Ma (1950) in Utah on alfalfa, sweetclover, and rabbitbrush.

Bryobia rubrioculus (Scheuten)

Sannio rubrioculus Scheuten, 1857:104.

Bryobia rubrioculus: Tuttle and Baker, 1968:7.

Collections were made from *Juniperus* sp. *ex* duff, Black Pine (Oneida Co.), Idaho, 3 May 1973; *Lonicera* sp. (honeysuckle), Hyde Park, Utah, 16 May 1972; *Populus tremuloides* Michx. *ex* duff, Monte Cristo, Utah, 21 Jun 1973; *Salix* sp. *ex* duff, Mantua, Utah, 17 May 1973; and *Sarcobatus vermiculatus* Torr. (greasewood) *ex* duff, Wildcat Hills (Box Elder Co.), Utah, 18 Apr 1974.

Bryobia neoribis, n. sp.

Figs. 1-7

This species is related to *Bryobia ribis* Thomas, a European species, but differs in having more slender body setae, in having the inner coxal I seta about twice as long as the outer serrate seta, in having

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